FIRST BIENNIAL TRANSPARENCY REPORT OF TÜRKİYE

Required by the Article 13 of the Paris Agreement

November 2024

www.iklim.gov.tr

EXECUTIVE SUMMARY

This document contains ***Türkiye's First Biennial Transparency Report (BTR)*** required by the Article 13 of the Paris Agreement. Türkiye's First BTR is prepared in accordance with Decision 18/CMA.1. It provides details on Türkiye's national greenhouse gas (GHG) inventory, progress toward its Nationally Determined Contribution (NDC), climate adaptation efforts, and includes information on support needed and received.

The Report provides detailed information and offers a comprehensive overview of the climate chance policies and measures of Türkiye. The Report provides a comprehensive overview of the trends and outcomes related to national circumstances, GHG emissions and sinks for the period covered. It also includes assessments of vulnerability, climate change impacts and adaptation, research findings, and systematic observations, as well as reviews of education, training, and public awareness efforts.

Türkiye submitted its ***Eighth National Communication (8NC) in 2023***, covering the period from 2019 to 2022, with findings finalized at the end of 2022 and GHG inventory data up to and including 2020. The First BTR builds on the data and information shared at the 8NC, expanding information coverage to 2024 and incorporating GHG inventory data up to and including 2022.

TURKİYE'S NATIONALLY DETERMINED CONTRIBUTION

Türkiye submitted its Intended Nationally Determined Contribution (INDC) in 2015, formalizing it as its first Nationally Determined Contribution (NDC) in 2022 while retaining its initial commitments. At COP27, Türkiye introduced the ***updated first NDC, committing to a 41% reduction in greenhouse gas emissions by 2030 compared to Business as Usual (BAU) projections*** for the same year. This target limits GHG emissions to 695 Mt CO_2 equivalent, down from the 1.215 Mt CO_2 eq. projected under BAU conditions. The NDC covers the entire economy, integrating both mitigation and adaptation measures to achieve comprehensive climate action. Additionally, it sets an ***enhanced target of net-zero emissions by 2053***, with emissions expected to ***peak by 2038***. The initial implementation period ***runs from January 1, 2022, to December 31, 2030***, with goals for 2030 against the BAU scenario.

Türkiye's NDC is both fair and ambitious, considering the country's national circumstances and developmental needs in areas such as infrastructure construction, services, housing, food, transport, education, and employment due

to its already increased population as well as anticipated future growth and the ongoing shift from rural to urban living. With a GDP per capita of 10,622 $ in 2022 and GHG emissions of 6.6 tons CO_2 eq. per capita—below the average of developed countries—Türkiye faces significant socio-economic challenges. Nonetheless, its commitment to the most ambitious mitigation target feasible reflects alignment with the principles of common but differentiated responsibilities (CBDR) and respective capabilities (RC), underscoring its dedication to global efforts to limit temperature increases to 1.5 degrees Celsius.

NATIONAL CIRCUMSTANCES

Türkiye has experienced significant demographic and economic changes in the last few decades. Its population has grown from 56.5 million in 1990 to **85.4 million in 2023** and is projected to reach 93.8 million in 2050. While there has been a decline in the rural population, the urban population has increased, with 93% of the population living in urban areas in 2023. The Country's **surface area is 783,562 km2**, and the **population density was 111 persons per km2** in 2023. The Turkish economy has generally experienced growth from 1990 to 2023, with **GDP (current price)** increasing from 149.2 billion $ to **1,130.01 billion $,** and **annual foreign trade volume** reached **617.6 billion $** in **2023**. The COVID-19 pandemic has significantly impacted Türkiye after its outbreak in early 2020. Türkiye implemented various measures to curb the spread of the virus, including lockdowns, curfews, and travel restrictions. These measures had a significant impact on the economy, with the tourism sector being particularly adversely affected. Number of tourists decreased from 51.86 million in 2019 to 15.83 in 2020 and 29.35 in 2021. In comparison to 2019, Türkiye's tourism income decreased 27.68 billion $ in 2020.

Starting from 2021, Türkiye started to recover from the impacts of COVID-19. The economy grew strongly by 11.4 percent in 2021. Türkiye continued growth in 2022 and became fastest growing country among the G20. In 2023, despite of the increasing commodity prices, the economy continued to grow by 5.1%.

Türkiye locates between subtropical and temperate zones, as well as its coastal location and mountainous landscape result in varying climatic conditions across different regions of the Country. The long-term annual mean temperature in Türkiye has increased to 13.9°C, and the annual mean precipitation was 573.4 mm between 1991 and 2020.

The **total primary energy supply** was 52.5 Mtoe in 1990 and since then it has increased by 200% reaching to **157.7 Mtoe in 2022.** In 2022, the industrial sector accounted for 31.3%, residential and services for 32.9%, transportation for 25.5%,

non-energy consumption for 5.8%, and agriculture for 4.1% of the final energy consumption. In the same year, 17.2% (24.9 Mtoe) of Türkiye's total primary energy supply was met by renewable energy sources. Renewable energy in Türkiye is supplied through various sources. In 2022, geothermal sources accounted for the highest proportion, contributing 42.5%, followed by hydraulic sources at 21.2%, biomass sources at 16.7%, wind at 11.1%, and solar energy at 8.6% among renewable energy sources. Approximately 710 bcm of natural gas reserves discovered in the Black Sea recently are expected to gradually reduce foreign dependency on natural gas, with the start of natural gas production in the field as of 2023.

The **total installed power capacity** of Türkiye increased fourfold since 1990 and reached **103.8 GW in 2022**, and it is expected to reach 189.7 GW by 2035. Annual electricity production grew from 57.5 TWh to 326 TWh in the same period. **The share** of **hydropower** was **20.5%, other renewables** were **21.2%,** natural gas was 21.9%, solid fuels was 35.0% and the percentage of liquid fuels were only 1.1%.

Türkiye's **manufacturing industry** accounts for 22.1% of Türkiye's GDP. The cement, iron and steel, and glass sectors significantly contribute to GHG emissions in the Country. Türkiye has a **high rate of urbanization** with a rapid annual urban population increase. In comparison to 2002, the annual number of new buildings increased by 107.7%, the annual number of new dwelling units increased by 291.5%, and the annual floor area of new buildings increased by 300.5% by 2022. This increase also boosts the demand for cement, steel, glass, and other materials. The **transportation sector** is responsible for 23.86% (26.97 Mtoe) of the Country's final energy consumption. While there were 3.8 million road motor vehicles in 1990, this number reached approximately 26.5 million in 2022. This was reflected in the rise of **road motor vehicles per 1000** people from 68 in 1990 to **310 in 2022**. Road transport was the largest energy consumer consisting of 94.44% of the energy consumption within the transport sector. **Waste generation** has been increasing in Türkiye, but there have been improvements in waste management since 1990, with a shift from open dumps to landfill sites.

INVENTORY OF GREENHOUSE GAS EMISSIONS AND SINKS

According to the latest greenhouse gas inventory of Türkiye, **total GHG emissions in 2022 was 502.17 Mt CO2 eq.** including the LULUCF and **558.27 Mt CO2 eq.** excluding the LULUCF, representing a 210.8% (including the LULUCF) increase with respect to the level realized in 1990. The energy sector accounted for the largest share of emissions with 71.8%, and CO2 emissions represented 79.1% of total CO2

eq. emissions. Türkiye's per capita GHG emission was 4.1 ton CO2 eq. in 1990 and increased to 6.6 ton CO2 eq. in 2022. While the total and per-capita emissions were increasing, Türkiye has been able to reduce its **GHG emissions intensity of GDP** by 50% between 1990 and 2022, from 1.53 ton CO2 eq. per 1,000 $ (current prices) to **0.62 ton CO2 eq. per 1,000 $** (current prices), and still achieving economic growth. This represents a significant improvement in efficiency.

The **energy sector**'s 2022 emissions were 400.59 Mt CO2 eq. (excluding LULUCF) and energy industries were the main contributor, accounting for 38.9% of emissions from the energy sector. It is followed by the transport sector with 22.9%, other sectors (fuel consumption at buildings and other emissions) with 18.8%, and manufacturing industries with 16.3%. The **IPPU sector**'s 2022 emission was 69.9 Mt CO2 eq. The most important GHG emissions sources of IPPU in 2022 were cement production, with 7.2%, and iron and steel production 1.7% shares of the total national GHG emissions excluding LULUCF. F-gases with 10.4 Mt CO2 eq. comprised 15% of the total IPPU emissions. The **agriculture sector**'s 2022 emission was 71.5 Mt CO2 eq., consisting of enteric fermentation at 53%, agricultural soils at 31%, and manure management at 6%. The sector was responsible for 61% of the total CH4 emissions and 78% of the total N2O emissions in 2022. The **waste sector**'s 2022 emission was 16.2 Mt CO2 eq.

POLICIES AND MEASURES

Türkiye became a party to the United Nations Framework Convention on Climate Change (UNFCCC) on 24 May 2004, ratified the Kyoto Protocol on 26 August 2009, and ratified the Paris Agreement on 7 October 2021. The Country's **first NDC** pledges to a **21% GHG emissions reduction compared to the business-as-usual level by 2030**. Türkiye revised and **increased its reduction target to 41% with its updated first NDC**. Moreover, Türkiye aims for **net-zero emissions by 2053**, and the updated first NDC aims for **peak emissions by 2038**.

The Eighth National Communication provided information up until the end of 2022 and First BTR follows the information up until 2024. However, most of the data covers until 2022 and 2023. Some of the key data for 2023 and 2024, such as GHG inventory, will be included in the next communication/BTR period. Türkiye has developed several cross-cutting and sectoral policies and measures to mitigate GHG emissions and to achieve these targets. The **12th Development Plan** was a multi-sectoral national policy that sets the country's vision for stronger, sustainable socioeconomic development, including key performance targets for climate change mitigation. This plan, covering 2024-2028 period, and its long-term

strategy towards 2053, includes targets for the increasing climate ambition of Türkiye. Key policy documents dedicated solely to Türkiye's climate change policies includes the **2024-2030 Climate Change Mitigation Strategy and Action Plan[1] (CCMSAP)** and the **2024-2030 Climate Change Adaptation Strategy and Action Plan (CCASAP)**[2]. Under the CCMSAP, Türkiye conducted a thorough needs analysis to evaluate existing climate change policies, strategies, plans, and mitigation measures aimed at reducing greenhouse gas (GHG) emissions. The plan encompasses ***49 strategies and 260 actions***, focusing on key sectors such as industry, energy, buildings, transportation, agriculture, waste, and Land Use, Land Use Change, and Forestry (LULUCF), alongside considerations for just transition and carbon pricing. Simultaneously, the CCASAP focuses on assessing anticipated climate risks using Türkiye-specific climate change projections. Vulnerability and risk assessments have been conducted at a national scale across various sectors. In response, ***40 strategies and 129 actions*** have been identified to address climate risks pertaining to agriculture and food security, biodiversity, water resources management, tourism, cultural heritage, industry, urban areas, social development, public health, transportation, communication, energy, disaster risk reduction, and cross-cutting issues.

The **Green Deal Action Plan of Türkiye** contains the actions for the green transformation of Türkiye's industries and adopting measures for harmonizing with the EU's Green Deal, especially in areas related to trade and industry. The **Türkiye National Energy Plan** and the **National Energy Efficiency Action Plan (NEEAP)** are two key documents in terms of energy policies that impact the country's emissions in various sectors. In addition, there are several other national strategies and action plans which influence the national emissions. In 2024, Türkiye updated its ***renewable energy*** target by setting a combined goal of ***120 GW*** for ***installed solar and wind power capacity by 2035***.[3]

Türkiye's energy policy prioritizes the use of renewable energy sources while reducing import dependency to improve supply security. Policies such as the **Renewable Energy Sources Support Mechanism (YEKDEM)** and **Renewable Energy Resource Areas (YEKA)** have significantly accelerated investments in renewable energy, especially for wind and solar power. **Nuclear power** is considered another means to improve supply security and reduce GHG emissions. Various policies and legislation also address **energy efficiency** in

[1] DOCC, 2024_a
[2] DOCC, 2024_b
[3] MENR, 2024_a.

buildings and industry. Increasing the **energy performance of new buildings** is one of the key policies of Türkiye. The **eco-design** approach is a crucial cross-cutting policy of Türkiye for energy efficiency. Türkiye has been investing in sustainable transport projects, such as **extending the railway network** and decreasing the share of road transport in freight transport. Türkiye has been promoting **electric and hybrid vehicles** and blending **biodiesel and ethanol** into fuels. **Controlling nitrate usage**, optimizing fertilizer amount, and promoting the sustainable use of agricultural waste are some of the relevant agriculture sector policies. There has also been increasing interest in investing in power generation from sanitary landfills through capturing **landfill gas** over the last decade, which decreases the waste sector emissions while leading to higher levels of renewable power generation. Türkiye also has active policies for **expanding**, improving, and protecting its **forest areas**.

PROGRESS TRACKING FOR ACHIEVING NDC AND PROJECTIONS

Türkiye's updated first NDC establishes an ambitious primary target: ***reducing GHG emissions from 1,215 Mt CO_2 eq. to 695 Mt CO_2 eq. by 2030***. This economy-wide approach utilizes the indicator "***Greenhouse Gases Reduced with Respect to the Business as Usual (BAU)***" scenario to measure progress, setting the BAU scenario as the baseline for mitigation efforts across all sectors. Achieving this target would represent a ***41% reduction in emissions*** by 2030 compared to the BAU scenario, underscoring Türkiye's strong commitment to comprehensive emissions mitigation.

Key data points in the NDC for tracking progress include projected emissions of ***593.19 Mt CO_2 eq. by 2025***, advancing toward the ***2030 target of 695.48 Mt CO_2 eq.*** Türkiye's most recent 2022 emissions were recorded at ***502.17 Mt CO_2 eq.,*** according to the latest inventory data.

While the NDC implementation period officially spans 2022-2030, 2020 data is included to highlight Türkiye's early achievements in emissions reduction prior to this period. Türkiye has already demonstrated notable success in reducing emissions, achieving ***553.01 Mt CO_2 eq in 2020***, representing a ***40% reduction below the BAU scenario*** and 27% below the first mitigation scenario established for the first NDC. The country's current trajectory aligns well with its reduction goals, reflecting a sustained commitment to economy-wide GHG mitigation.

CLIMATE CHANGE IMPACTS AND ADAPTATION

Türkiye has experienced significant changes in its climate in recent decades. The **Turkish State Meteorological Service** (TSMS) has reported that temperatures have

been consistently rising since the base year 1990, with 2010 seeing the highest mean temperature on record, at 1.6 °C above the average. **In the first eight months of 2024**, the mean temperature in Türkiye was 16.8 °C; this value is **2.3 °C above the 1991-2020 average** of 14.5°C which makes 2024 the warmest year since 1971. Türkiye's mean areal precipitation in 2024 for 8 months (Jan. to August) was 348.8 mm. This value is 4% under the 1991-2020's mean values of 365.0 mm. Türkiye's mean areal precipitation in 2023 was 641.5 mm. This value is **12% above the 1991- 2020's normal** (573.4 mm). In 2022 Türkiye's mean areal precipitation was recorded as 503.8 mm. The amount is approximately 12.1%, below 1991-2020's normal of 573.4 mm.

A large part of Türkiye is located in the subtropical Mediterranean climate zone with dry summers. Türkiye is a country with a medium to high risk of climate change and future climate risks. In this context, there is a need for studies on the issues of climate monitoring, climate change vulnerability and risk assessments as well as adaptation measures to reduce the adverse impacts of climate change. Türkiye analyzed the changes in the Country from 1971-2000 reference period to 2021-2100 projection period using the MPI-MR-ESM model under the RCP4.5 and RCP8.5 scenarios. The results of the MPI-ESM-MR model shows that the reference period had an **average temperature of 14-19°C** in the **coastal areas of the Aegean and Mediterranean Regions** and **Southeastern Anatolia**, and **12°C in the Marmara Region**, with decreasing temperatures towards the higher elevations of the East Anatolia Region. Both scenarios predict higher temperatures than the reference period, with the **RCP8.5 scenario projecting an increase of 2.5°C until the 2060s and over 5°C by the end of the century.** Precipitation levels during the reference period were lowest in Central Anatolia and southern Southeastern Anatolia and highest in the Eastern Black Sea Region. The RCP4.5 scenario projects an average increase of 50 mm in the Marmara and Black Sea Regions and a decrease of 200 mm in the Mediterranean Region during the 2061-2080 period, while the RCP8.5 scenario predicts fluctuations of precipitation between -100 to +100 mm until the 2060s, with the **Black Sea Region** projected to have an **increase of 150 mm** and the **Mediterranean Region** projected to have **a decrease of 300 mm** by the end of the century.

Changes in temperature and precipitation have had significant impacts on Türkiye, including an increase in the frequency and severity of extreme weather events such as floods and droughts. Türkiye has reinforced its commitment to climate adaptation by publishing the updated **Climate Change Adaptation Strategy and Action Plan (2024-2030)** and the **12th Development Plan** in 2024.

These documents outline strategic actions and specific targets to enhance resilience to climate change impacts across society and the economy in response to the increasing frequency of extreme meteorological events. In 2023, Türkiye recorded **1,475 disasters**, the highest number of **extreme meteorological events** to date, underscoring the urgent need for robust adaptation measures.

SUPPORT NEEDED

Türkiye's ambitious climate agenda, as guided by its NDC, 2053 net-zero target and climate related action plans and roadmaps, necessitates significant climate finance and technological investments. As a developing country with relatively negligible historical responsibility for GHG emissions, Türkiye takes ambitious actions to mitigate and adapt climate change through funding climate activities including national investment projects primarily from its own resources. Although there is a need for more comprehensive analyses mirroring the costs and investment needs of mitigation and adaptation measures in Türkiye, some macroeconomic and sector-specific assessments and planned works offer insights into costs and investment needs. The 12th Development Plan projects that Türkiye needs annual additional investments equivalent to at least 1.7% of its Gross National Income in key sectors such as energy, building, industry, transport, agriculture, and forestry to achieve net-zero emissions by 2053. The World Bank's Türkiye Climate Change Development Report estimates that to achieve net zero emissions by 2053, Türkiye would need to invest an additional $68 billion until 2030 and a total of $165 billion from 2022 to 2040.

Furthermore, investment needed in renewable energy to achieve the targets set out in the National Energy Plan is estimated around $73 billion by 2035. For targeted energy efficiency actions in the country between 2024-2030, $20.2 billion in public and private investment is foreseen. Low-carbon roadmaps for cement, steel, aluminum, and fertilizers in line with 2053 net zero target demand nearly $72 billion investment in total for advanced techniques, clean technologies, policy measures, and financing requirements.

Under the UNFCCC, a cooperation mechanism for technology development and transfer are created to assist developing countries. However, due to its status within the UNFCCC, Türkiye is not eligible to benefit from the Climate Technology Centre and Network, the implementing body of the Technology Mechanism. The absence of access to these mechanisms that offer technical support, information exchange, and knowledge sharing has led to Türkiye struggling to harness the potential of technology development and transfer, which is vital for an effective

global response to climate change. Türkiye also deems necessary to enhance cooperation in research, development, demonstration, and innovation, particularly in hard-to-abate sectors, to strengthen its domestic capacities and technologies to achieve the long-term goals of the Paris Agreement. Hydrogen, carbon capture and storage, and battery technologies are at the forefront of innovative solutions aimed at decreasing industrial emissions and achieving zero emissions in the country's energy sector. Moreover, Türkiye places emphasis on promotion of the development and production of new-generation vehicles, advanced battery technologies, cutting-edge chip technologies, efficient solar cells, and innovative wind turbines, with its flagship initiative, the High Technology Incentive Program (HIT-30). The country's efforts must be supported by enhanced access to clean technologies, along with appropriate enabling frameworks and international cooperation.

Türkiye's climate strategies for mitigation and adaptation cover a broad range of capacity building actions in various sectors, with an emphasis on the needs for institutional and technical infrastructure, training, and public awareness. The country identifies a number of capacity building steps in the industry, energy, building, agriculture, waste and LULUCF sectors and cross-cutting areas such as just transition and carbon pricing. Receiving support for its capacity building actions plays a pivotal role in enhancing the effectiveness of climate mitigation and adaptation actions of the country. Enhancing Türkiye's institutional ability to monitor climate finance is essential for better reporting, given the absence of an agreed definition and a unified MRV system on climate finance.

SUPPORT RECEIVED

Türkiye has declared to implement the Paris Agreement as a developing country and its developing country status has been recognized by many international organizations, including the UN, World Bank and OECD. The UN's World Economic Situation and Prospects 2024 Report, consistent with earlier reports, includes Türkiye among developing countries. The country is eligible for Official Development Assistance and Global Environment Facility support and classified by the World Bank as an upper middle-income country, granting it access to the Bank's financing. Despite its developing country status, Türkiye lacks access to the Green Climate Fund and Climate Technology Centre and Network, hindering its climate initiatives and technology development/transfer potential. Türkiye expects financial, technological, and capacity-building support from developed countries, as outlined in the Paris Agreement, to achieve its NDC and 2053 net-zero targets. Ensuring Türkiye's access to these resources under the Paris

Agreement will definitely support the country's efforts to meet its climate targets and thus strengthen the global climate response. Türkiye's ability to mitigate emissions and absorb climate finance can also catalyze more private sector investments in green projects, which is ultimately needed for more meaningful climate actions.

Over the past decades, despite Türkiye's considerable investments in building a climate-resilient and low-carbon economy with its national resources, this funding will fall short of the country's climate finance needs, considering the large financial gap. Besides national budget and limited domestic private sector funds, external financing from international institutions, bilateral agencies, climate funds, and private banks is essential for Türkiye's climate actions. Nevertheless, this funding is typically not concessional or grants, with private finance being the main source, concentrated in mitigation areas. These resources involve sovereign bond issuances in the international capital markets, MDBs and bilateral financing institutions loans and grants, export credits, guarantee, equity and de-risking instruments for public investment and capacity building projects. To fund its growing climate investment needs, the government has partnered with various bilateral and multilateral development institutions, such as the World Bank Group, European Bank for Reconstruction and Development (EBRD), Asian Infrastructure Investment Bank (AIIB), Islamic Development Bank (IsDB), Council of Europe Development Bank (CEB), Japan Bank for International Cooperation (JBIC), German Development Bank (KfW) and French Development Agency (AFD).

In the light of worsening impacts of climate change, as seen in recent droughts, floods, and wildfires, Türkiye requires greater external climate finance and stronger partnerships with the MDBs, bilateral agencies and Climate Funds to particularly address its adaptation needs. To meet its climate finance needs, in October 2021, Türkiye signed a Memorandum of Understanding with the World Bank (IBRD and IFC), EBRD, Germany, France and the UN to provide the country with approximately $3.2 billion in climate financing for three years. This climate finance package is designed to support Türkiye's sustainable development actions in line with its NDC and its 2053 vision.

In addition to the international public concessional financing, innovative financial instruments such as blended finance, Public-Private Partnership models, results-based finance, local currency debt, and guarantees can play a crucial role for significantly boosting green investments and unlocking more private funding in the adaptation sector, helping to reduce the adverse effects of climate change.

Having considered low bankability nature of the adaptation activities, highly concessional or grant-based finance is most-needed in adaptation.

RESEARCH AND SYSTEMATIC OBSERVATION

There are several research institutions in Türkiye which are actively working on climate research. TUBITAK and universities are the key institutions while the MoEUCC, MENR, and MoAF have their own strategy and research centers to develop technologies, which will enable Türkiye reach its climate targets. These ministries also provide RDI supports in their relevant technology areas.

Türkiye prioritized five topics focused on five main themes namely **"Climate Change, Environment and Biodiversity", "Clean and Circular Economy", "Clean, Accessible and Secure Energy Supply", "Green and Sustainable Agriculture", "Sustainable Smart Transportation"** for the green transition of the Türkiye in the light of Green Deal Action Plan. Projects focusing on these topics are being prioritized in the TUBITAK's R&D and Innovation Supports and co-creation models for both knowledge creation and development of human resources are being mobilized by TUBITAK.

Within the scope of the Action Plan, **"Green Growth Technology Roadmap"** studies are being carried out by the MoIT and TUBITAK. The Technology Roadmap study is being conducted for the Iron-Steel, Aluminum, Cement, Chemicals, Plastics and Fertilizer sectors; which are critically important for the Turkish economy and have high carbon emissions. Because of the Technology Roadmap studies, priority R&D and innovation themes for each sector will be detailed.

The **TSMS** is the sole authority for conducting **atmospheric measurements** in Türkiye. The organization of the TSMS is widespread and covers the entire country, with 16 regional directorates, and the observation network is connected to these regional directorates. As of 2022, the number of systems in the observation network has reached 1,715. TSMS operates a wide range of **weather observation** and **monitoring systems** including *Automatic Weather Observation Station (AWOS), "Airport Automatic Weather Observation Station (A-AWOS), Handheld Automatic Weather Stations (HAWS), Meteorological Satellite Ground Receiver Systems, Meteorological Radar Systems.* The TSMS uses global models for forecasting and ensuring a high level of accuracy and consistency in **weather forecasts** and **early warnings**. In addition to preparing and communicating meteorological warnings, the TSMS also prepares and presents short and medium-term weather forecasts to the public. The TSMS has demonstrated a high-level of

consistency in precipitation and temperature forecasting, with an average of 85.4% for long-term precipitation forecasting and 91.5% in 2020 and 92.4% in 2021.

The **General Directorate of State Hydraulic Works (DSI)** is responsible for carrying out **hydrometeorological observation** activities in Türkiye. Within the scope of observation activities, DSI carries out instantaneous hydrometric, hydrometeorological, sediment, snow and water quality observations in 25 basins across the country, as well as monitoring environmental water flow released from Hydroelectric Power Plants (HEPPs). There were 8,759 active stations and 1,603 online stations in a hydrometeorological observation network as of 2022. There are also 3,618 monitoring points within the scope of the water quality monitoring program between 2019-2021. These monitoring points are spread across 25 river basins in Türkiye to collect data on various water quality parameters.

The duty of the preparation of the water quality monitoring programmes belongs to the MoAF **Directorate General of Water Management (DGWM).** The DGWM is responsible for determining policies related to the protection, improvement and usage of the water resources. In this scope, the mission of keeping up to date the digital water resources data and preparing water quality monitoring programmes for 25 river basins are being executed by DGWM. Digital water resources data and accordingly surface water types, surface water bodies and eventually water quality monitoring programmes have been lastly revised in 2021. In the recent surface water monitoring programmes, there is a total of 3905 surveillance, 4929 operational and 1793 protected area monitoring points for 25 river basins. Moreover, reference (pristine) water bodies for biological quality elements and reference monitoring points were determined by DGWM and reference monitoring studies are carried out in these bodies.

The TSMS has developed several key tools and systems to support its research and services in the field of climate and climate change. The **"Meteorological Communication and Applications Package (METCAPPLUS)"** and ***"Flash Flood Guidance System (FFGS) Model"*** *were developed by the TSMS and used by other countries.* Türkiye was recognized as the ***"Regional Training Center (RTC)"*** of the World Meteorological Organization (WMO) and the TSMS operated three RTC in Ankara, Istanbul, and Alanya in 2022, and has trained over 1900 international participants from more than 150 countries through various training events.

Moreover, the **Turkish State Meteorological Service (TSMS)**, the **General Command of Mapping** and the **Middle East Technical University, Institute of Marine Sciences** (METU-IMS) play significant roles in **ocean climate observing systems**. The **General Directorate of Geographic Information System** established

a national spatial information infrastructure called the **ATLAS Application**. The aim of this application is to facilitate geographic data sharing through a technical infrastructure that enables querying metadata via the national spatial data portal. The **General Directorate of Combating Desertification and Erosion (ÇEM)** in Türkiye has been actively involved in international cooperation efforts to combat desertification and land degradation.

The **Ministry of Culture and Tourism (MoCT)** is responsible for the management, monitoring and preservation of cultural heritage and World Heritage Sites (WHS) in Türkiye. In 2019, the MoCT established a Project Coordination Office (PCO) under the Directorate-General Cultural Assets and Museums (KVMGM) to investigate cutting-edge approaches and best-practices on impact assessment, climate change mitigation and adaptation for museums and cultural heritage sites.

OTHER ISSUES

The **Ministry of National Education (MoNE)** is responsible for administering education in Türkiye. As part of efforts to improve education, MoNE provides in-service trainings for teachers and administrators. Between 2017 and 2022, MoNE organized seminars and courses on various topics related to climate change, energy efficiency, and zero waste, and trained a total of 339,639 teachers and administrators. To further promote environmental education, MoNE updated the curriculum of the Environmental Education elective course, which has been renamed Environmental Education and Climate Change. Starting in the 2022-2023 academic year, this course is being taught in secondary schools (6th, 7th, and 8th grades) twice a week, for a total of 72 hours. The updated curriculum consists of six units: human and nature, circular nature, environmental problems, global climate change, climate change and Türkiye, and sustainable development and environmentally friendly technologies.

Overall, MoNE's efforts to improve environmental education in Türkiye have been extensive and impactful, with significant investments in training for teachers and administrators, as well as curriculum updates that reflect the importance of climate change and sustainability.

Through a collaborative interdisciplinary effort, the MoNE has developed a strategic Climate Change Action Plan tailored specifically to educational institutions. This plan encompasses awareness-raising, adaptation, and knowledge-empowering activities, and is currently being implemented across all types and levels of educational institutions.

Turkish State Meteorological Service (TSMS) provides information on scientific findings of climate and climate change and projections. TSMS also has a vital role of providing an early warning system to the public informing about expected climatic events through the website and smart phone application.

The **Zero Waste Project** of Türkiye was launched in 2017 by the MoEUCC, aiming to increase public awareness about the importance of reducing waste and promoting recycling, and encouraging municipalities, businesses, and individuals to adopt zero waste practices. The project focused on waste reduction, waste prevention, separation at source and recycling. Global waste generation is expected to increase by 70% by 2050, with the highest rates of waste growth occurring in developing countries. The "Zero Waste" Project, was carried to the global scale through the United Nations General Assembly Resolution entitled **"Promoting Zero Waste Initiatives to Advance 2030 Agenda for Sustainable Development"**. As a result of this Resolution, which was presented by Türkiye and adopted in the UN 77th General Assembly with the valuable support of 105 co-sponsor countries, Türkiye will contribute to the global efforts to combat climate change to achieve the Sustainable Development Goals promoting circularity, and to the implementation of the Paris Agreement.

The **"Young Climate Envoys Movement Project"** was initiated by the MoEUCC to increase youth participation in the fight against climate change in line with Türkiye's net-zero emissions and green development goals. The project involves young climate envoys from universities across Türkiye who work to increase social awareness of climate change and encourage green and climate-friendly studies. The project aims to provide training to strengthen institutional capacities, expand climate communities in universities, and increase climate change awareness.

Private institutions have a complementary role to the state institution's efforts by reaching many other stakeholder groups in many areas and sectors. Also, climate change has been pulling the attention of the media over the recent years which resulted with several TV documentaries, regular TV programmes and several writers in newspapers and magazines.

TABLE OF CONTENTS

EXECUTIVE SUMMARY I

TURKİYE'S NATIONALLY DETERMINED CONTRIBUTION I
NATIONAL CIRCUMSTANCES II
INVENTORY OF GREENHOUSE GAS EMISSIONS AND SINKS III
POLICIES AND MEASURES IV
PROGRESS TRACKING FOR ACHIEVING NDC AND PROJECTIONS VI
CLIMATE CHANGE IMPACTS AND ADAPTATION VI
SUPPORT NEEDED VIII
SUPPORT RECEIVED IX
RESEARCH AND SYSTEMATIC OBSERVATION XI
OTHER ISSUES XIII

TABLE OF CONTENTS XV

1 TÜRKIYE'S NATIONALLY DETERMINED CONTRIBUTION 1

1.1 DESCRIPTION OF THE NATIONALLY DETERMINED CONTRIBUTION 1
1.2 THE NDC AND ITS CONNECTION TO BTR 3
1.3 INDICATORS OF THE NATIONALLY DETERMINED CONTRIBUTION 6
1.3.1 DESCRIPTION OF INDICATORS 6
1.3.2 METHODOLOGIES AND ACCOUNTING APPROACHES 7

2 NATIONAL CIRCUMSTANCES 10

2.1 GOVERNMENT STRUCTURE 11
2.2 POPULATION PROFILE 13
2.3 GEOGRAPHICAL PROFILE 14
2.4 CLIMATE PROFILE 16
2.4.1 TEMPERATURE 16
2.4.2 PRECIPITATION 18
2.4.3 EXTREME WEATHER EVENTS 19
2.5 ECONOMIC PROFILE 20
2.6 ENERGY INDUSTRIES 24
2.6.1 PRIMARY ENERGY 25
2.6.2 WASTE HEAT 31
2.6.3 ELECTRICITY SECTOR 32
2.6.4 ENERGY EFFICIENCY 35

2.7 BUILDING STOCKS AND URBANIZATION 36
2.8 MANUFACTURING INDUSTRIES AND CONSTRUCTION 39
2.9 TRANSPORTATION 40
2.10 WASTE 45
2.11 AGRICULTURE 49
2.11.1 AGRICULTURAL LANDS 50
2.11.2 LIVESTOCK 51
2.11.3 VALUE ADDED 53
2.11.4 ORGANIC AGRICULTURE 54
2.11.5 AGRICULTURAL SOILS 54
2.12 FORESTRY 55
2.12.1 FOREST RESTORATION 57
2.13 TOURISM 59
2.14 WATER RESOURCES 61
2.15 CLIMATE FINANCE FRAMEWORK 62
2.16 TÜRKİYE'S SPECIAL CIRCUMSTANCES 64

3 INVENTORY OF GREENHOUSE GAS EMISSIONS AND SINKS 70

3.1 GREENHOUSE GAS EMISSION TRENDS 70
3.1.1 GENERAL FACTORS UNDERLYING EMISSION TRENDS 73
3.1.2 GHG EMISSION TRENDS BY GAS 75
3.1.3 INDIRECT GHG EMISSIONS 77
3.2 GREENHOUSE GAS EMISSIONS BY SECTOR 78
3.2.1 ENERGY 78
3.2.2 INDUSTRIAL PROCESSES AND PRODUCT USE 91
3.2.3 AGRICULTURE 95
3.2.4 LAND USE LAND USE CHANGE AND FORESTRY 98
3.2.5 WASTE 100
3.3 NATIONAL INVENTORY SYSTEM 102
3.3.1 INSTITUTIONAL, LEGAL AND PROCEDURAL ARRANGEMENTS 102
3.3.2 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) AND VERIFICATION 106
3.3.3 REPORTING UNDER ARTICLE 3, PARAGRAPHS 3 AND 4, OF THE KYOTO PROTOCOL 108
3.3.4 NATIONAL REGISTRY 109

4 POLICIES AND MEASURES 110

4.1 INSTITUTIONAL, LEGISLATIVE AND POLICY FRAMEWORKS AND MONITORING AND EVALUATION APPROACH 110
4.1.1 OVERVIEW 110
4.1.2 POLICYMAKING AND INSTITUTIONAL FRAMEWORK 110

4.1.3 LEGISLATIVE FRAMEWORK 113
4.1.4 MAIN POLICY DOCUMENTS 114
4.1.5 KEY TARGETS 115
4.1.6 MONITORING AND EVALUATION OF POLICIES AND MEASURES 117
4.2 POLICIES AND MEASURES AND THEIR EFFECTS 118
4.2.1 CROSS-CUTTING POLICIES AND MEASURES 119
4.2.2 ENERGY INDUSTRIES 133
4.2.3 BUILDINGS 151
4.2.4 TRANSPORT 159
4.2.5 INDUSTRY, INDUSTRIAL PROCESSES AND PRODUCT USE 177
4.2.6 AGRICULTURE 186
4.2.7 LAND USE, LAND USE CHANGE AND FORESTRY (LULUCF) 196
4.2.8 WASTE 201
4.2.9 POLICIES AND MEASURES IN ACCORDANCE WITH ARTICLE 2 209
4.2.10 POLICIES AND MEASURES NO LONGER IN PLACE 213

5 PROGRESS TRACKING FOR ACHIEVING NDC AND PROJECTIONS 214

5.1 KEY ASSUMPTIONS 214
5.2 BUSINESS-AS-USUAL SCENARIO (WITHOUT MEASURES) 215
5.3 MITIGATION SCENARIO (WITH MEASURES) 216
5.4 NDC INDICATORS 220
5.4.1 PRIMARY INDICATOR 220
5.4.2 ADDITIONAL INDICATORS 222
5.5 SUPPLEMENTARITY RELATING TO THE MECHANISMS PURSUANT TO ARTICLES 6, 12 AND 17 OF THE KYOTO PROTOCOL 223

6 CLIMATE CHANGE IMPACTS AND ADAPTATION 224

6.1 NATIONAL CIRCUMSTANCES, INSTITUTIONAL ARRANGEMENTS, AND LEGAL FRAMEWORKS 224
6.1.1 NATIONAL CIRCUMSTANCES 224
6.1.2 INSTITUTIONAL ARRANGEMENTS 225
6.1.3 LEGAL FRAMEWORKS 225
6.2 IMPACTS, RISKS AND VULNERABILITIES 227
6.2.1 IMPACTS 227
6.2.2 VULNERABILITY AND RISK ASSESSMENT 240
6.3 ADAPTATION PRIORITIES AND BARRIERS 244
6.3.1 ADAPTATION PRIORITIES FOR CLIMATE CHANGE IN TÜRKIYE 244
6.3.2 ADAPTATION CHALLENGES AND GAPS 262
6.3.3 ADAPTATION STRATEGIES, POLICIES, PLANS, GOALS, AND ACTIONS 266
6.3.4 ADAPTATION GOALS AND OBJECTIVES 270

6.3.5 SCIENCE, GENDER, AND KNOWLEDGE INTEGRATION 273
6.4 PROGRESS ON IMPLEMENTATION OF ADAPTATION 275
6.4.1 IMPLEMENTATION PROGRESS 275
6.4.2 COORDINATION AND POLICY CHANGES 278
6.5 MONITORING AND EVALUATION OF ADAPTATION ACTIONS AND PROCESSES 280
6.5.1 MONITORING SYSTEMS IN PLACE 280
6.6 COOPERATION, GOOD PRACTICES, EXPERIENCE, AND LESSONS LEARNED 281
6.6.1 SHARING INFORMATION AND BEST PRACTICES 281

7 SUPPORT NEEDED AND RECEIVED 282

7.1 INSTITUTIONAL ARRANGEMENTS AND COUNTRY-DRIVEN STRATEGIES 282
7.1.1 INSTITUTIONAL ARRANGEMENTS 282
7.1.2 COUNTRY-DRIVEN STRATEGIES 285
7.1.3 UNDERLYING ASSUMPTIONS, DEFINITIONS AND METHODOLOGIES 288
7.2 INFORMATION ON FINANCIAL SUPPORT NEEDED 291
7.2.1 OVERVIEW 291
7.2.2 MITIGATION RELATED NEEDS 292
7.2.3 ADAPTATION RELATED NEEDS 297
7.3 INFORMATION ON FINANCIAL SUPPORT RECEIVED 301
7.4 INFORMATION ON TECHNOLOGY DEVELOPMENT AND TRANSFER SUPPORT NEEDED 309
7.5 INFORMATION ON CAPACITY-BUILDING SUPPORT NEEDED 313
7.6 INFORMATION ON CAPACITY-BUILDING SUPPORT RECEIVED 317
7.7 INFORMATION ON SUPPORT NEEDED AND RECEIVED FOR THE IMPLEMENTATION OF ARTICLE 13 OF THE PARIS AGREEMENT AND TRANSPARENCY-RELATED ACTIVITIES, INCLUDING FOR TRANSPARENCY-RELATED CAPACITY-BUILDING 324

8 RESEARCH AND SYSTEMATIC OBSERVATION 327

8.1 GENERAL POLICY ON RESEARCH AND SYSTEMATIC OBSERVATION 327
8.1 RESEARCH 329
8.1.1 RESEARCH AND DEVELOPMENT INNOVATION (RDI) SUPPORTS 329
8.1.2 HUMAN RESOURCES SUPPORTS 332
8.1.3 FURTHER PLANNING 334
8.1.4 RDI ACTIVITIES 334
8.2 SYSTEMATIC OBSERVATION 337
8.1.1 ATMOSPHERIC AND TERRESTRIAL CLIMATE OBSERVING SYSTEMS 337
8.1.2 OCEAN CLIMATE OBSERVING SYSTEMS 348
8.1.3 CRYOSPHERE OBSERVATIONS 349
8.2 OTHER ACTIONS TAKEN TO SUPPORT RELATED CAPACITY- BUILDING IN DEVELOPING COUNTRIES 349

8.2.1 INTERNATIONAL COOPERATION BY THE TURKISH STATE METEOROLOGICAL SERVICE 349
8.2.2 INTERNATIONAL COOPERATION BY THE GENERAL DIRECTORATE OF COMBATING DESERTIFICATION AND EROSION 350
8.3 NATIONAL AND INTERNATIONAL DATA SHARING..... 351

9 REFERENCES..... 354

LIST OF FIGURES

Figure 1 - Alignment of Türkiye's First BTR with BTR Requirements and NDC Commitments 5
Figure 2 - Geographical regions of Türkiye 16
Figure 3 - Annual Mean Temperature in Türkiye 17
Figure 4 - Long-term Mean Temperature Distribution in Türkiye (TSMS, 2022) 17
Figure 5 - Annual Total Precipitation in Türkiye (1990-2022) 18
Figure 6 - Long-term Mean Total Precipitation Distribution in Türkiye (TSMS, 2022) 19
Figure 7 - Total numbers of annual extreme weather events in Türkiye (1940-2023) 20
Figure 8 - Extreme weather events in 2023 20
Figure 9 – GDP, Billion USD, 1990 – 2022 21
Figure 10 - Foreign trade, 1990-2023 22
Figure 11 - Primary Energy Supply 1990-2022 25
Figure 12 - Final energy consumption by sector, 1990-2022 26
Figure 13 - Distribution of final energy consumption by sectors (%), 2022 27
Figure 14 - The share of Renewable energy by energy resources, 2022 28
Figure 15 - Electricity generation by primary energy resources, 1990-2023 33
Figure 16 - Electricity generation and shares by energy resources, 1990 – 2022 34
Figure 17 - Number of new buildings' occupancy permit by year (2002-2022) 37
Figure 18 - Number of buildings by building type in 2000 38
Figure 19 - Energy consumption in buildings by energy resource (2022) 38
Figure 20 - Road motor vehicles, 1990-2022 41
Figure 21 – Change in passenger transport in Türkiye (1990-2022) 42
Figure 22 - Distribution of cars registered to the traffic according to fuel type, 2004 - 2023 43
Figure 23 – Annual Automobile Sales By Fuel Type (2022-2023) 44
Figure 24 - Total domestic and international travel passengers at the airports 45

Figure 25 – Recovered methane at the solid waste disposal sites (2002-2022) 46
Figure 26 – Wastewater amount and services 47
Figure 27 – Recovered methane at the wastewater treatment facilities (2002-2022) 48
Figure 28 - Agriculture Basins of Türkiye 50
Figure 29 - Total arable land and land under permanent crops (1990-2022) 51
Figure 30 - Livestock population, 1990-2022 52
Figure 31 - Population numbers for cattle categories, 1990–2022 53
Figure 32 - Value added of Agriculture sector as % of GDP, 1960-2022 54
Figure 33 – Change in forest areas of Türkiye (1990-2022)....57
Figure 34 - Reforestation Activities, 1992-2020. 58
Figure 35 - Forest Rehabilitation Activities, 1998-2020. 58
Figure 36 - Number of tourists (1990-2023)....60
Figure 37 – Tourism Income and Expenditure (2013-2023)....61
Figure 38 - Greenhouse gas emissions/removals, Mt CO2 eq., 1990-2022....71
Figure 39 - GHG emission trend by sectors, Mt CO2 eq., 1990-2022....72
Figure 40 - Trends in emissions per capita and dollar of GDP relative to 1990....74
Figure 41 –GHG emissions from installations under the scope of MRV system (2022-2023)....75
Figure 42 - Emission trend of main GHGs, 1990-2022 76
Figure 43 - Trends in emissions by gas relative to 1990 77
Figure 44 – Energy Sector Emissions, 1990-2022 79
Figure 45 - Fuel combustion CO2 eq. emissions by sectors, 1990 and 2022 80
Figure 46 – The Trend in the Emissions from Fuel Consumption by the Energy Industries Sector (1990-2022) 82
Figure 47 – The Trend in the Emissions from Fuel Consumption by the Manufacturing Industries and Construction Sector (1990-2022) 83
Figure 48 – The Trend in the Emissions from Fuel Consumption by the Transport Sector (1990-2022) 84

Figure 49 - GHG emission by transport mode, 1990-2022 85

Figure 50 - GHG emission trend by transport mode except road transportation, 1990-2022 85

Figure 51 - Emission distributions by fuel types in road transportation (1990-2022) 86

Figure 52 - GHG emissions for domestic aviation, Mt CO2 eq., 1990-2022 87

Figure 53 – GHG Emissions by Sub-Sectors within the 'Other Sectors' Category (2022) 88

Figure 54 – The Trend in the Emissions from Fuel Consumption by the Other Sectors (1990-2022) 89

Figure 55 - Emissions from industrial processes and product use by subsector, 2022 92

Figure 56 - Emissions from industrial processes and product use by subsector, 1990–2022 93

Figure 57 - Share of CO2 emissions from mineral production, 2022 94

Figure 58 - Emissions from metal industry, 2022 95

Figure 59 - Cumulative emissions of agricultural categories, 1990–2022 96

Figure 60 - Enteric Fermentation Emission Sources, 2022 97

Figure 61 - Sub-categories of Agricultural Soils Emission Sources, 2022 98

Figure 62 - The trend of LULUCF sector removals (Forest Land and HWP) 1990-2022 99

Figure 63 - Trend of total emissions from the LULUCF sector, 1990-2022 100

Figure 64 - CH4 emissions from solid waste disposal, 1990-2022 102

Figure 65 - Phasing Out Schedules for Ozone Depleting Substances (ODS) Consumption 185

Figure 66- Phasing Down Schedules for Hydrofluorocarbon (HFC) Consumption 185

Figure 67 – Türkiye's GHG emission projections in With and Without Measures Scenarios 218

Figure 68- Comparison of baseline scenario (WoM), mitigation scenario (WM) and realized GHG emissions for 2020 220

Figure 69 - Annual Mean Temperature of Türkiye 228

Figure 70 - Annual Total Precipitation in Türkiye 229

Figure 71 - The Current Period Meteorological Drought Intensity 232

Figure 72 - According to the Reference Period a) RCP4.5 Scenario b) RCP8.5 Scenario for the Future Projections of SPEI3 Percentage (%) Changes 233

Figure 73 - The Current Period Heavy Precipitation (mm) 234

Figure 74 - According to the Reference Period a) RCP4.5 Scenario b) RCP8.5 Scenario for the Future Projections of R95P Changes 235

Figure 75 - Current Period Heatwave Frequency (day) 236

Figure 76 - According to the Reference Period a) RCP4.5 Scenario b) RCP8.5 Scenario for the Future Projections HWF Frequency 237

Figure 77 - Current Period Forest Fire Weather Index (FWI) 238

Figure 78 - According to the Reference Period a) RCP4.5 Scenario b) RCP8.5 Scenario for the Future Projections FWI Changes (%) 239

Figure 79 - Disaster Profile in Türkiye 241

Figure 80 Gross domestic expenditure on R&D (as a percentage of GDP, 2002-2022) 336

Figure 81 - Distribution of the TSMS's regional directorates 338

Figure 82 - Observation Network by TSMS in Türkiye 341

LIST OF TABLES

Table 1 – Türkiye's Main Indicator to Track NDC Progress 6
Table 2 - Selected indicators of Türkiye, 1990-2022 10
Table 3 - Population of Türkiye 14
Table 4 - Türkiye's Exports in 2023 in product groups covered by CBAM 23
Table 5 - Main indicators of industry sector, 2021 39
Table 6 –Selected Key Indicators for Transportation Sector 40
Table 7 - Forest inventory results of Türkiye, Area 2020. 56
Table 8 - Forest inventory results of Türkiye, Growing Stock, 2020. 56
Table 9 - Forest inventory results of Türkiye, Annual Increment, 2020. 56
Table 10 - Greenhouse gas emissions/removals, Mt CO2 eq., 1990-2022 72
Table 11 - Aggregated GHG emissions excluding LULUCF, Mt CO2 eq., 1990-2022 76
Table 12 - Total emissions for indirect greenhouse gases, kt, 1990-2022 78
Table 13 – Total emissions from fuel consumption by sectors, Mt CO2 eq., 1990-2022 80
Table 14 - Fugitive emissions from fuels, kt, 1990-2022 89
Table 15 - Fugitive emissions from fuels by subcategory, 1990-2020 (kt CO2 eq.) 90
Table 16 - Industrial processes and product use sector emissions, (kt CO2 eq.), 2022 91
Table 17 - Total emissions and removals from the LULUCF sector by source (kt CO2 eq.) 99
Table 18 - Total emissions from the waste sector by source (kt CO2 eq.) 101
Table 19 - Institutions by Responsibilities for National GHG Inventory 105
Table 20 – Climate Change Mitigation Related Key Targets of the 12th Development Plan 116
Table 21 – Cross-cutting policies and measures 121
Table 22 – Energy sector policies and measures 139
Table 23 – Buildings sector policies and measures 155

Table 24 – Transport sector policies and measures 164

Table 25 – Manufacturing industry, industrial process and product use sector policies and measures 181

Table 26 – Agriculture sector policies and measures 191

Table 27 – LULUCF sector policies and measures 200

Table 28 – Waste sector policies and measures 205

Table 29 - Policies and measures policies and measures in accordance with article 2 210

Table 30 – Key Assumptions used in the projections of the first NDC 215

Table 31 - Emissions by sector based on Business-As-Usual Scenario (Without Measures) 215

Table 32 - Emissions by sector based on Mitigation Scenario (With Measures) .. 217

Table 33 – Sectoral Comparison* of 2030 Targets of First and Updated First NDC of Türkiye 218

Table 34 – Comparison of baseline scenario (WoM), mitigation scenario (WM) and realized GHG emissions for 2020 219

Table 35 – Projection of Main Indicator 220

Table 36 - Ranking of the Seasonal and Annual Warmest Decades 228

Table 37 - Ranking of the Seasonal and Annual Wettest and Driest Decades... 230

Table 38 - Projected energy efficiency investments between 2024-2030 under the Second National Energy Efficiency Action Plan 293

Table 39- An overview of estimated investment needs in selected sectors in line with for Türkiye's Updated First NDC and other climate targets including 2053 . 298

Table 40 - Financial support received by the public institutions under the MoU 303

Table 41 - The technology needs and priorities under the Climate Change Mitigation Strategy and Action Plan 310

Table 42 - Main Targets under the Green Growth Technology Roadmap 312

Table 43 - Capacity Building Support Received 318

Table 44 - transparency support received 326

Table 45 - Types of stations connected to the regional directorates 338

Table 46 - Types and number of observation stations installed by State Hydraulic Works[39] 344

Table 47 - Water Quality Monitoring Points of 2019-2021 345

ABBREVIATIONS

AECC	*Air Emissions Coordination Council*
AFAD	*Disaster and Emergency Management Authority*
ASDEP	*Family Social Support Programme*
BIST	*Borsa Istanbul Inc.*
BRSA	*Banking Regulation and Supervision Agency*
CCACB	*Climate Change and Adaptation Coordination Board*
CCAMCB	*Climate Change and Air Management Coordination Board*
CCCB	*Climate Change Coordination Board*
CH_4	*Methane*
CLRTAP	*Convention on Long-range Transboundary Air Pollution*
CO	*Carbon Monoxide*
CO_2	*Carbon Dioxide*
CO_2 *eq.*	*Carbon Dioxide Equivalent*
CoHE	*Council of Higher Education*
CRT	*Common Reporting Table*
ÇEM	*General Directorate of Combating Desertification and Erosion*
DOCC	*Directorate of Climate Change*
DGWM	*Directorate General of Water Management*
DSİ	*Directorate General of State Hydraulic Works*
EMRA	*Republic of Türkiye Energy Market Regulatory Authority*
EU	*European Union*
ETS	*Emissions Trading System*
F-gases	*Fluorinated Gases*
FAO	*Food and Agriculture Organization*
GDP	*Gross Domestic Product*
GWh	*Gigawatt Hour*
HadGEM	*Hadley Centre Global Environment Model*
HCFC	*Hydrochlorofluorocarbon*
İLBANK	*İlbank Inc.*
IPA	*Instrument for Pre-Accession Assistance*
IPCC	*Intergovernmental Panel on Climate Change*
IPPU	*Industrial Processes and Product Use*

ISO	*International Organization for Standardization*
KOSGEB	*General Directorate for Development and Support of SMEs*
KOSGEB	*Small and Medium Enterprises Development Organization of Türkiye*
KÖYDES	*Village Infrastructure Support Project*
Kt	*Kilo tons*
kWh	*Kilowatt Hours*
LDN	*Land Degradation Neutrality*
LULUCF	*Land Use, Land Use Change and Forestry*
MENR	*Republic of Türkiye Ministry of Energy and Natural Resources*
Mha	*Million hectares*
MoNE	*Republic of Türkiye Ministry of National Education*
MoAF	*Republic of Türkiye Ministry of Agriculture and Forestry*
MoCT	*Ministry of Culture and Tourism*
MoEUCC	*Republic of Türkiye Ministry of Environment, Urbanization and Climate Change*
MoFA	*Ministry of Foreign Affairs*
MoH	*Republic of Türkiye Ministry of Health*
MoI	*Republic of Türkiye Ministry of Interior*
MoIT	*Republic of Türkiye Ministry of Industry and Technology*
MoT	*Republic of Türkiye Ministry of Trade*
MoTF	*Republic of Türkiye Ministry of Treasury and Finance*
MoTI	*Republic of Türkiye Ministry of Transport and Infrastructure*
MRV	*Monitoring, Reporting and Verification*
Mt	*Million tons*
MTA	*Directorate General of Mineral Research and Exploration*
MToe	*Million tons of oil equivalent*
MÜSİAD	*Independent Industrialists and Businessmen's Association*
MW	*Megawatt*
MWe	*Megawatt electricity*
MWt	*Megawatt thermal*
N_2O	*Nitrous Oxide*
NC	*National Communication*
NCCS	*National Climate Change Strategy*
NE	*Not Estimated*

NID	*National Inventory Document*
NIR	*National Inventory Report*
NGO	*Non-Governmental Organization*
NMVOC	*Non-Methane Volatile Organic Compounds*
NO	*Not Occurred*
NOx	*Nitrogen Oxides*
OECD	*Organisation for Economic Co-operation and Development*
OIZ	*Organized Industrial Zone*
OSP	*Official Statistics Programme*
PMR	*Partnership for Market Readiness*
PMI	*Partnership for Market Implementation*
PPP	*Public-Private Partnership*
PPP	*Purchasing Power Parity*
R&D	*Research and Development*
SBB	*Presidency of Strategy and Budget*
SDG	*Sustainable Development Goals*
SME	*Small and Medium-Sized Enterprises*
SO2	*Sulphur Dioxide*
SOE	*State-Owned Enterprise*
SPI	*Standardized Precipitation Index*
SSI	*Social Security Institution*
STI	*Science, Technology and Innovation*
TBB	*The Union of Municipalities of Türkiye*
TEİAŞ	*Directorate General of Turkish Electricity Transmission Corporation*
TEMA	*The Turkish Foundation for Combating Soil Erosion, for Reforestation and the Protection of Natural Habitats*
TOBB	*Turkish Union of Chambers and Commodity Exchange*
TOE	*Tonne of Oil Equivalent*
TOKİ	*Housing Development Administration*
TSE	*Turkish Standards Institution*
TSMS	*Turkish State Meteorological Service*
TÜBİTAK	*The Scientific and Technological Research Council of Türkiye*
TÜÇA	*Turkish Directorate of Environment Agency*

TUDES	*Turkish National Sea Level Monitoring Network*
TÜRKAK	*Turkish Accreditation Agency*
TurkStat	*Turkish Statistical Institute*
TURSAB	*Association of Turkish Travel Agencies*
TÜSİAD	*Turkish Industry and Business Association*
TWh	*Terawatt Hours*
UCLG	*United Cities and Local Governments*
UCLG-MEWA	*UCLG Middle East and West Asia Section*
UN	*United Nations*
UNCCD	*United Nations Convention to Combat Desertification*
UNDP	*United Nations Development Programme*
UNECE	*United Nations Economic Commission for Europe*
UNESCO	*United Nations Educational, Scientific and Cultural Organization*
UNFCCC	*United Nations Framework Convention on Climate Change*
WIGOS	*WMO Integrated Global Observing System*
WMO	*World Meteorological Organization*
WOUDC	*World Ozone and Ultraviolet Radiation Data Centre*
WRF	*Weather Research and Forecasting*
YEKA	*Renewable Energy Resource Areas*
YEKDEM	*Renewable Energy Sources Support Mechanism*

1 TÜRKIYE'S NATIONALLY DETERMINED CONTRIBUTION

To align with decisions 1/CP.19 and 1/CP.20 of the COP, Türkiye submitted its Intended Nationally Determined Contribution (INDC) to the UNFCCC on 30 September 2015[4]. In 2022, Türkiye formalized this initial target as its Nationally Determined Contribution (NDC) without altering its goals or assumptions[5]. During COP27, Türkiye announced an enhanced target of net-zero emissions by 2053, with emissions expected to peak by 2038. Under this updated NDC, Türkiye commits to a 41% reduction in GHG emissions by 2030, targeting an emission level of 695 Mt CO2 eq. This mitigation target is based on a Business as Usual (BAU) scenario projected for 2030, with 2012 as the base year for setting assumptions[6]. Covering the entire economy, Türkiye's NDC includes both mitigation and adaptation actions, with a clear focus on implementation.

Türkiye considers its NDC to be fair and ambitious in light of its national circumstances, acknowledging the need for improvements in social and economic development areas such as education and employment. With a GDP per capita of $8,600 in 2020, Türkiye is behind developed countries and even some developing countries. Furthermore, Türkiye's 6.4 ton CO_2 eq. GHG emissions per capita in 2020 is below the average of developed countries. Despite these challenges, Türkiye has adopted the most ambitious mitigation target possible, reflecting its unique national circumstances and aligning with the principle of common but differentiated responsibilities (CBDR) and respective capabilities (RC). Türkiye also actively supports the global goal of limiting temperature increases to 1.5 degrees Celsius.

1.1 DESCRIPTION OF THE NATIONALLY DETERMINED CONTRIBUTION

1.1 DESCRIPTION OF THE NATIONALLY DETERMINED CONTRIBUTION

Türkiye's NDC targets encompass comprehensive, economy-wide goals for greenhouse gas (GHG) emission reductions. These include reducing emissions from the Business as Usual (BAU) scenario, reaching peak emissions by 2038, and achieving net zero emissions by 2053. The target year for emission reduction against the BAU scenario is set for 2030, with the implementation period spanning

[4] INDC of Türkiye, 2015.
[5] First NDC of Türkiye, 2021.
[6] Updated first NDC of Türkiye, 2022.

from 2012 to 2030. Implementation of these targets is scheduled between January 1, 2022, and December 31, 2030.

Türkiye's mitigation policies cover sectors such as energy, industry, transport, agriculture, building, waste, and Land Use, Land-Use Change, and Forestry (LULUCF), addressing all major anthropogenic GHG emissions and removals per the 2006 IPCC Guidelines and as reported in the National Inventory Report (NIR). The GHGs covered include CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3. Additionally, LULUCF pools include living biomass, dead organic matter, soil carbon, and harvested wood products as carbon reservoirs. Adaptation policies address agriculture and forestry, water, disaster risk management, urban, rural development, and public health sectors.

Türkiye's NDC consists of eight chapters. The **first chapter**, titled *Introduction*, presents general information as well as Türkiye's climate targets, providing a comprehensive overview of its commitments and ambitions. The **second chapter** outlines Türkiye's current climate policies and those planned for 2030. The **third chapter** assesses Türkiye's mitigation policies, offering an in-depth analysis of the current status and policies across sectors such as energy, industry, transportation, agriculture, buildings, waste, and land use, including land-use change and forestry (LULUCF). The **fourth chapter** addresses Türkiye's adaptation policies, covering sectors such as agriculture and forestry, water, disaster risk management, urban development, rural development, public health, and others. The **fifth chapter** details institutional developments and stakeholder engagement. The **sixth chapter** is dedicated to finance, while the **seventh chapter** provides Türkiye's climate indicators. Finally, the **eighth chapter** includes information under the title Information to *Facilitate Clarity, Transparency, and Understanding* regarding Türkiye's NDC.

1.1.1.1 NDC Targets

- To achieve economy-wide emission reduction from the Business as Usual (BAU) scenario.
- To reach peak emissions.
- To achieve net zero emissions.

1.1.1.2 Target years

- The target year for emission reduction according to the Business as Usual (BAU) scenario is 2030

- The peak emission target year is 2038
- The net zero emission target year is 2053.

1.1.1.3 Reference points

- The reference period is between 2012–2030. The Business as Usual (BAU) projection year is 2030. The reference year is 2012 and projection year is 2030 as in Türkiye's first NDC.

1.1.1.4 Time frames for implementation

- 01 January 2022 – 31 December 2030

1.1.1.5 Scope and coverage

- Economy-wide.
- Sectors:
    - Mitigation policies cover the energy, industry, transport, agriculture, building, waste, and LULUCF sectors. The sectors, gases, categories and pools covered by Türkiye's NDC are based on the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. It reflects all major anthropogenic GHG emissions and removals as reported in the National Inventory Report (NIR).
    - Adaptation policies cover the agriculture and forestry, water, disaster risk management, urban, rural development, and public health sectors.
- Gases
    - Carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF6) and nitrogen trifluoride (NF3)
- Pools and Reservoirs
    - LULUCF pools are included in the NDC: living biomass, DOMs, Soil including harvested wood products carbon reservoir.

1.2 THE NDC AND ITS CONNECTION TO BTR

Türkiye has gained substantial experience in preparing national communications (NC). Under the UNFCCC, Türkiye is required to submit a NC every four years. So far, Türkiye has prepared and submitted eight National Communications (NCs): the First National Communication (NC1) on Climate Change in 2007[7]; the Second,

[7] 1st NC of Türkiye

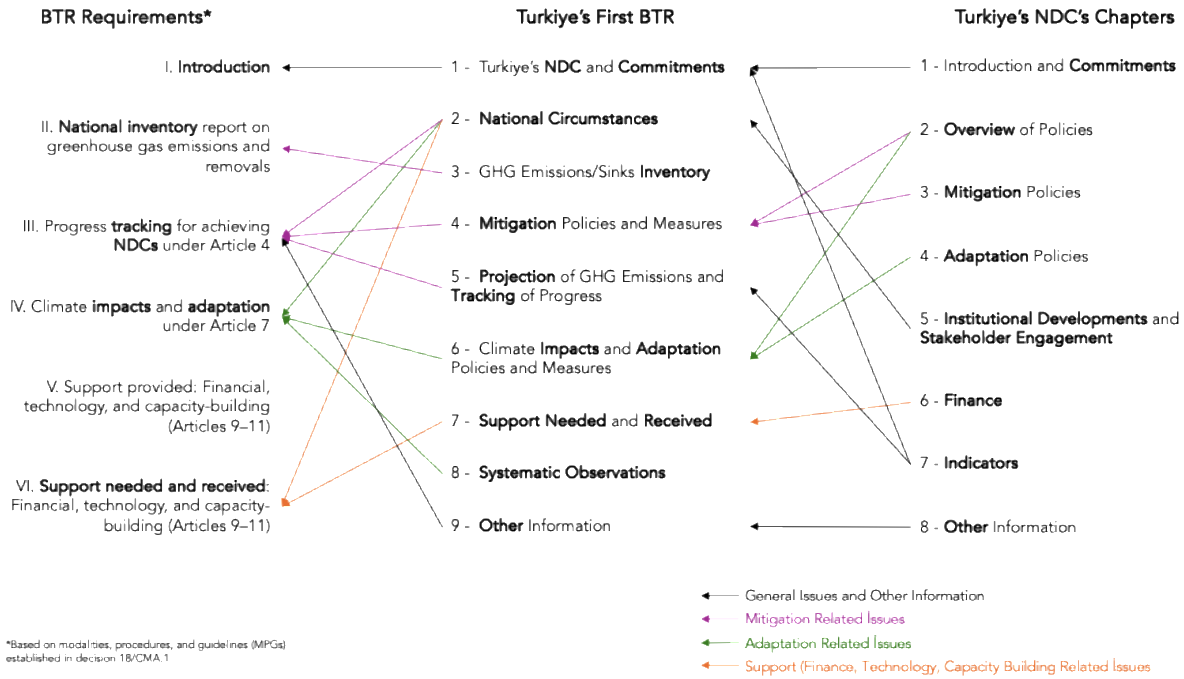
Third, Fourth and Fifth National Communication (joint report) in 2013[8]; the Sixth National Communication in 2016[9], the Seventh National Communication in 2019[10] and the Eight National Communication in 2023[11], in line with the decision 9/CP.16.

Additionally, under the Paris Agreement, a Biennial Transparency Report (BTR) Türkiye will need to be submitted every two years. The contents of the NC and BTR largely overlap, and it is acceptable to submit both NC and BTR in the same year. Both documents are comprehensive and require extensive collaboration among numerous public institutions within the country. Moreover, a significant portion of the data used in both NC and BTR is sourced from the National Inventory Document (NID). Given these considerations, preparing the NC and BTR in similar formats and with consistent content will facilitate the preparation and tracking of these documents. Therefore, Türkiye has prepared its first BTR with reference to the recently submitted eighth NC report.

The content of the BTR must adhere to the modalities, procedures, and guidelines (MPGs) established in decision 18/CMA.1. In this initial BTR, Türkiye has presented the required information in a visualized format to enhance the tracking of BTR elements. Additionally, the BTR serves as a report on the monitoring of commitments and policies outlined in Türkiye's NDC, necessitating a clear link between the BTR and NDC content. In this context, Türkiye has visually represented the relationship between the BTR and the NDC.

[8] 5th NC of Türkiye
[9] 6th NC of Türkiye
[10] 7th NC of Türkiye
[11] 8th NC of Türkiye

Figure 1 - Alignment of Türkiye's First BTR with BTR Requirements and NDC Commitments



In light of these considerations, the **first chapter** of the BTR, titled "**NDC and Commitments**," provides detailed information on Türkiye's NDC and commitments. The MPG guidelines for the BTR require Türkiye to evaluate its current status and national circumstances concerning mitigation, adaptation, and finance, which are largely overlapping topics. Therefore, the "**National Circumstances**" chapter, which is the **second chapter** of the BTR, presents integrated information on these three areas. The **third chapter** of the BTR focuses on Türkiye's **national GHG emissions and removals inventory**, relying largely on data from the NID. The **fourth and fifth chapters** cover Türkiye's **mitigation policies and measures** and **NDC tracking**. The **sixth chapter** addresses the **impacts of climate change and adaptation policies and measures**. The **seventh chapter** details the **needed and received support** of Türkiye, covering aspects of finance, technology, and capacity building. As a developing country, Türkiye does not report on finance provided. The **eighth chapter**, related to adaptation, includes **systematic observations**. Finally, the **ninth chapter** provides **other relevant information**.

1.3 INDICATORS OF THE NATIONALLY DETERMINED CONTRIBUTION

1.3.1 DESCRIPTION OF INDICATORS

1.3.1.1 Primary Indicator

Türkiye's main indicator is "***Greenhouse Gases Reduced with Respect to BAU.***" This indicator is quantified based on national GHG emissions as reported in Türkiye's National Inventory Report (NIR). In 2020, GHG emissions were recorded at 466.9 Mt CO_2 eq. including LULUCF. Subsequent recalculation adjusted this value to 472.5 Mt CO_2. Türkiye's NDC sets a 41% emission reduction target by 2030 compared to the Business as Usual (BAU) scenario, based on a BAU projection of 1175 Mt CO_2 eq including LULUCF by 2030. Turkiye's GHG emissions including LULUCF increased to 502.2 Mt CO_2 eq in 2022.

Türkiye's NDC is economy-wide; therefore, total GHG emissions serve as the most appropriate indicator for this type of NDC.

Table 1 – Türkiye's Main Indicator to Track NDC Progress

Indicator selected to track progress	**Description**
Net Greenhouse Gases Reduced with Respect to the BAU	
Description	The indicator encompasses Türkiye's energy, industry, transport, agriculture, building, waste, and LULUCF sectors. It includes greenhouse gases such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3). Additionally, LULUCF pools are incorporated within the indicator, covering living biomass, dead organic matter (DOMs), soil, and carbon reservoirs in harvested wood products. The sectors, gases, categories, and pools reflected in the indicator are based on the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, ensuring a standardized and comprehensive approach. This indicator reflects all major anthropogenic GHG emissions and removals, as documented in the National Inventory Report (NIR).
Starting Year, Current Year and Target Year Committed Data	2012: 413 Mt CO2 Eq. 2022: 502 Mt CO2 Eq. 2030: 695 Mt CO2 Eq.
Updates in accordance with any recalculation of the GHG inventory, as appropriate	2012 recalculation in 2024: 382 Mt CO2 Eq.
Relation to NDC	Türkiye's NDC is economy-wide; therefore, total GHG emissions serve as the most appropriate indicator for this type of NDC.
Differences to the NIR	No differences

Co-benefits	N/A

1.3.1.2 Additional Indicators

Türkiye has defined, in addition to its main indicator, nine supplementary indicators covering mitigation and adaptation topics.

- Avoided CO2 Emissions with Newly Installed Renewable Power Plants
- Share of Renewable Resources in Electricity Generation
- Urban Rail Systems Network Length
- Ratio of Forest Areas to Country Area
- Number of Metropolitan Municipality Completed Local Climate Change Action Plans
- Number of Drinking and Potable Water Treatment Plants
- Ratio of Municipality Population Served by Wastewater Treatment Plant to Total Municipality Population
- Proportion of Municipal Population with Landfill Services
- HFCs consumption

1.3.2 METHODOLOGIES AND ACCOUNTING APPROACHES

Türkiye uses net GHG emissions in 2030 as the primary reference indicator for its NDC. This indicator is published annually in the National Inventory Report in accordance with the IPCC 2006 Guidelines for GHG emissions and is consistent with decision 18/CMA.1. The definitions, data sources, and models used to estimate net emissions are detailed within the National Inventory Report, ensuring methodological consistency and transparency.

Under the modalities, procedures, and guidelines established in Decisions 4/CMA.1 and 18/CMA.1, Türkiye submits an annual National Inventory Report (NIR) and Biennial Transparency Report (BTR) to the UNFCCC Secretariat. The NIR provides a comprehensive account of Türkiye's anthropogenic GHG emissions and removals, while the BTR presents structured updates on progress towards achieving Türkiye's NDC. Türkiye's approach for NDC accountability involves comparing achieved net GHG emission reductions against its 2030 NDC target. Türkiye ensures consistency with current and future UNFCCC reporting guidelines for tracking and reporting NDC progress.

Türkiye applies specific assumptions and methodologies, as appropriate, to assess progress under the policies and measures related to the implementation of its NDC in its Biennial Transparency Reports (BTRs).

Türkiye uses the 2006 IPCC Guidelines, or any future updates approved by the CMA, for estimating anthropogenic greenhouse gas emissions and removals. Global warming potential (GWP) values on a 100-year timescale, as specified in the IPCC's Fifth Assessment Report, are used to calculate CO_2 equivalents.

To address emissions and subsequent removals from natural disturbances on managed lands, Türkiye prioritizes wildfire management as the primary strategy. Wildfires are the major natural disturbance affecting emissions in Türkiye, and the national approach has shifted from a focus on suppression to prevention and preparedness. This shift aims to reduce both fire-related emissions and associated management costs, utilizing drones and advanced technological tools. Additionally, Türkiye is working to enhance public participation and awareness, recognizing that local communities play a vital role in effective fire management, with their collaboration and contributions considered invaluable.

To account for emissions and removals from harvested wood products, Türkiye applies the "Production Approach" as outlined in IPCC 2006 (Vol.4, Chapter 12.A.1). This approach calculates emissions based solely on carbon inventories from domestically harvested wood, without providing a complete inventory of wood carbon in national stocks. The calculation uses a Tier 1 method and incorporates country-specific coefficients to ensure accuracy in emissions estimates.

To address the effects of age-class structure in forests, Türkiye is developing a comprehensive National Forest Inventory, expected to be completed by the end of 2025 and subsequently repeated in 5-year cycles. Currently, the Forest Service utilizes inventories from temporary sample plots for management, conducted at 10-year intervals. Given that the General Directorate of Forestry effectively oversees forest management, Türkiye anticipates that the age-class structure will support continued increases in Net Primary Productivity. However, recent data from the planning database suggests that additional efforts may be needed to increase the standing stock of forest stands.

Türkiye reserves the right to use voluntary cooperation under Article 6 of the Paris Agreement, as considerations for the application of market mechanisms under Article 6 are still ongoing. If Türkiye decides to engage in such cooperation,

corresponding adjustments would be applied, and all reporting requirements in line with guidance adopted under Article 6 by the CMA would be fulfilled.

Türkiye's fairness considerations are rooted in the principle of equity, aligned with the approach of Common But Differentiated Responsibilities and Respective Capabilities (CBDR-RC) as established under the UNFCCC and the Paris Agreement.

In addressing Article 4, paragraph 3 of the Paris Agreement, Türkiye has updated its first NDC, initially submitted to the UNFCCC Secretariat in 2015, which covered the period from 2012 to 2030. Through substantial investments across multiple sectors, Türkiye has significantly accelerated its emission reduction efforts, increasing its ambition from a 21% reduction to a 41% reduction by 2030 compared to the first NDC's BAU scenario. This enhanced target aligns with Türkiye's long-term objective of achieving net zero emissions by 2053.

In addressing Article 4, paragraph 4 of the Paris Agreement, Türkiye is not among the countries obligated to maintain a leadership role, as recognized by the Conference of the Parties in consideration of its special circumstances. Nevertheless, as a developing country, Türkiye remains committed to implementing its mitigation efforts with the highest possible ambition, taking into account its national conditions.

2 NATIONAL CIRCUMSTANCES

This chapter elaborates Türkiye's national circumstances relevant to its climate change mitigation and adaptation policies, as well as its GHG inventory. It provides a detailed analysis of factors influencing Türkiye's climate change policies and its NDC, including the government structure, demographic trends, and economic growth. Additionally, it examines geographical and climatic profiles, energy and industrial sectors, and the management of natural resources, such as water, forests, and agricultural lands, which directly impact GHG emissions and removals. These national circumstances underpin Türkiye's approach to addressing climate change, shaping both the strategic priorities set out in its NDC and the data reported in its GHG inventory. This information is essential for understanding Türkiye's progress in its NDC targets and tracking advancements in its commitments.

Economic and demographic data indicate Türkiye's rapid growth, with GDP expanding by 507% and electricity consumption per capita rising by 363% between 1990 and 2022. This economic and population expansion has driven increases in energy demand and urbanization, contributing to a 145% rise in GHG emissions. Furthermore, the rural-to-urban shift, with rural populations decreasing by 59% and urban populations growing by 145%, underscores the changing landscape that Türkiye must consider in climate change policies. (Table 2).

Table 2 - Selected indicators of Türkiye, 1990-2022[12]

Indicators	1990	2000	2010	2020	2021	2022	Change (%) in the most

[12] Data sources: Worldbank, GDP, TurkStat_a, 2020 for population, MENR, 2020 for energy, UNFCCC, 2020 for GHG emissions/removals data. For final year, 2022 selected to match the year of the latest GHG inventory.

							recent year in the table compared to 1990
GDP (current, Billion US$)	149.20	273,09	777.46	717.14	807.92	905.81	507%
GDP per capita (current US$)	2,655	4,249	10,629	8,600	9,601	10,659	301%
Population (million people)	56.47	64.73	73.72	83.61	84.68	85.28	50%
Urban Population (million people)	32.53	42.01	56.22	77.74	78.91	79.61	145%
Rural Population (million people)	22.59	22.72	17.50	9.36	9.23	9.21	-59%
Total Primary Energy Supply (Mtoe)	52.50	79.40	105.90	147.17	159.43	157.77	201%
Primary Energy Supply Per Capita (toe/person)	0.93	1.17	1.44	1.75	1.88	1.85	99%
Electricity consumption per capita (kWh/capita)	829	1,450	2,334	3,910	3,902	3,837	363%
Total GHG emissions (Excluding LULUCF) (Mt CO2 eq.)	228.00	306.39	405.27	530.18	571.99	558.27	145%
Greenhouse Emissions Per Capita (ton CO2 eq. per capita)	4.14	4.73	5.50	6.34	6.75	6.55	58%

2.1 GOVERNMENT STRUCTURE

Türkiye is a presidential representative democracy and a constitutional republic. The legislative branch is the Grand National Assembly of Türkiye (GNAT), which is responsible for enacting laws and overseeing the government's actions. GNAT is consisting of 600 elected members who serve five-year terms. The public elects the President for a maximum of two five-year terms. The President wields executive power, overseeing the appointment of vice presidents and ministers, as well as leading the central administration. There are 17 ministries[13] and several other

[13] Ministry of Justice, Ministry of Foreign Affairs, Ministry of the Interior, Ministry of National Defense, Ministry of Treasury and Finance (Former Ministry of Finance), Ministry of Energy and Natural Resources, Ministry of Industry and Technology (former Ministry of Science, Industry and Technology), Ministry of Trade (former Ministry of Customs and Trade and former Ministry of Economy), Ministry of Environment, Urbanization and Climate Change (former Ministry of Environment and Urbanization), Ministry of National Education, Ministry of Health, Ministry of Transport and Infrastructure (former Ministry of Transport, Maritime Affairs and Communication), Ministry of Culture and Tourism,

administrative units. The judicial branch, composed of independent courts and judges, responsible for enforcing the laws.

Türkiye's local administration structure is organized into 81 provinces. There are two main administrative structures at the provincial level; governorates and municipalities. Governorates serve as the central government and its structures' representation. Governorates are headed by a governor, who the central government appoints, and is responsible for coordinating policy and regulation implementation. The governor is supported by district governors responsible for ensuring that policies and regulations are implemented effectively at the district level. Municipalities have a range of responsibilities, including infrastructure development, public transportation, waste management, water supply and sewerage, and land use planning. Municipalities are headed by a mayor, who is elected by the public for a five-year term. 30 of 81 provinces of Türkiye are metropolitan areas, each managed by a metropolitan municipality mayor. District municipality mayors manage the district municipalities and collaborate with the metropolitan municipality to ensure adequate public service conditions within the metropolitan area.

The Ministry previously known as the Ministry of Environment and Urbanization (MoEU) in Türkiye was officially renamed to the Ministry of Environment, Urbanization, and Climate Change (MoEUCC) on October 29, 2021, as per Presidential Decree No. 85 published in the Official Gazette No. 31643. [14] This change reflects the ministry's broader mandate, incorporating climate change into its core responsibilities, indicating a shift in focus towards addressing the impacts of climate change alongside urbanization and environmental concerns.

Before this reorganization, climate change initiatives were managed by a department under the Directorate General of Environmental Management at the MoEU. This department was tasked with handling climate change issues as part of a wider environmental management strategy. However, the reorganization led to the establishment of the Directorate of Climate Change (DOCC) as a separate directorate, elevating the focus on climate change issues. This structural change underscores the Turkish government's commitment to more specialized and

Ministry of Labor and Social Security (former Ministry of Family, Labor and Social Services, Ministry of Family and Social Services, Ministry of Agriculture and Forestry (former Ministry of Food, Agricult ure and Livestock and Ministry of Forestry and Water Affairs), Ministry of Youth and Sports.

[14] The Presidential Decree No. 85, published in the Official Gazette dated 29 October 2021, and numbered 31643.

focused efforts in combating climate change, reflecting the global urgency of addressing this issue.

In terms of authority and responsibilities concerning climate change, the MoEUCC is tasked with developing and implementing policies, strategies, and actions to mitigate and adapt to the effects of climate change. This includes coordinating national efforts to reduce GHG emissions, enhancing resilience to climate change impacts across various sectors, and ensuring Türkiye's compliance with international agreements and commitments related to climate change. Main administrative organization under the MoEUCC for these activities is the DOCC. The DOCC specifically focuses on climate policy development, monitoring, and reporting on climate change-related activities. The DOCC is also assigned as the focal national administration of Türkiye to the UNFCCC. The organizational structure, working procedures, and principles of the DOCC were officially established with the publication in the Official Gazette on June 21, 2022, numbered 31873. This legal framework provides the DOCC with a clear mandate and operational guidelines to effectively carry out its duties. Türkiye's governmental structure on formulation, implementation and evaluation of climate change policies is elaborated at the Section 4.1.2.

2.2 POPULATION PROFILE

While the population of Türkiye was 56.47 million in 1990, it reached to 85.28 million in 2022. (See Table 3) Despite the increase in population experienced since 1990, a significant decrease was observed in the population growth rate for the 1990-2020 period. It is anticipated that the population will reach to 88.19 million by the year 2030 and 93.77 by 2050 with an approximate annual increase rate of 1% during the period between 2020 and 2030 and with a decreasing annual growth rate in 2025-2050. While the annual population growth rate shows a declining trend until 2054, the population peaks at 93.9 million in 2053 and then begins to decrease from that year onward. This downward trend is expected to continue, with Türkiye's population projected to decline to 76.8 million by 2100.[15]

In 2022, 89.2% of the population lived in urban areas, and 10.8% of the population inhabited in rural areas. In 2022, the median age rose to 33.5. By gender, the median age increased from 32.4 to 32.8 for men and from 33.8 to 34.2 for women between 2021 and 2022. The working age population was between 15 and 64,

[15] TurkStat, 2024_a.

comprised 68.1% of the whole population. 22.0% of the population was 0-14 years and 9.9% was over 65 or older. Population density in 2022 was 111 person/km2.[16]

Increasing population especially in urban areas has a significant effect on the increased demand for housing, energy, and transportation in urban areas of Türkiye. An increase in greenhouse gas emissions is expected alongside the increase in population. Furthermore, since most of the population resides in urban areas, the policies and actions of local authorities are particularly important in influencing emission increase.

Table 3 - Population of Türkiye[17]

Data	1990	2000	2010	2015	2020	2022
Population (millions)	56.47	67.80	73.72	78.74	83.61	85.28
Female (millions)	*27.87*	*33.46*	*36.68*	*39.23*	*41.70*	*42.6*
Male (millions)	*28.61*	*34.35*	*37.04*	*39.51*	*41.92*	*42.7*
Annual growth rate of population (‰)	21.7	18.3	15.9	13.4	5.5	7.1
Population density (person/km^2)	73	88	96	102	109	111
Urban population (% of total)(1)	51.3	59.2	71	87.6	88.8	89.2
Rural Population (% of total)(2)	48.7	40.8	29.0	12.4	11.2	10.8

(1) "Urban population" is defined as population of the localities which has population 20.001 and over

(2) "Rural population" is defined as population of the localities which has population 20.000 and below.

2.3 GEOGRAPHICAL PROFILE

Türkiye is situated between the Northern latitudes of 36°- 42° and eastern longitudes of 26°- 45°. It is surrounded by Georgia, Armenia, Nakhichevan and Iran in the east; Bulgaria and Greece in the west; Syria and Iraq in the south; and by the Black, Mediterranean, Aegean and Marmara Seas in three directions. Türkiye acts as a bridge between Asia and Europe with the straits of Istanbul and Dardanelles. Türkiye has 2,875 km of land borders and 8,333 km of sea borders. This geography renders Türkiye vulnerable to potential sea level rise due to climate change.

[16] TurkStat, 2023_a.

[17] TurkStat, 2023_a; Ministry of Health, 2022.

The surface area of Türkiye is 785,264 km2 and approximately 29% is forest land, 34.3% is cropland, 30.6% is grassland, 2.1% (16.472 km2) is wetlands and 3.7% is settlements and other land. Türkiye has a diversity of freshwater systems including a 1,263 km length of the Euphrates River and 523 km length of the Tigris River. There are many natural lakes and artificial lakes of various sizes. Türkiye is a mountainous country with an average altitude of 1,141 meters.[18]

Türkiye's rich biodiversity is in part due to hosting a wide range of ecosystems including forests, mountains, steppe, wetlands, coastlines and seas, as well as its location at the intersection of the three bio-geographical regions: the European-Siberian (Paleo-boreal European Forest); Mediterranean; and Iran-Turan. This impressive diversity of ecosystems and habitat is home to a significant diversity of species. For example, Türkiye contains approximately 19,000 invertebrate species, of which approximately 4,000 are endemic. In terms of plant diversity, while there are only 12,500 gymnosperm and angiosperm plant species in the whole of the European continent, according to The National Biodiversity Inventory and Monitoring Project, the number of vascular plant species and sub-species taxa has reached 12.141, approximately one-third of which are endemic to Türkiye. Meanwhile, The National Biodiversity Inventory and Monitoring Project reveals that, 500 birds, 175 mammals, 146 reptiles, 39 amphibians, and 403 species of freshwater fish were identified in Türkiye. In total, 1,263 vertebrate animal species were identified at 472,016 inventory spatial points, of which 206 are endemic[19]. Climate change has the potential to pose a significant threat to the biological diversity of Türkiye.

Türkiye has seven geographical regions based on its terrain, climate, and physical features. These seven regions are the Marmara Region, Black Sea Region, Aegean Region, Mediterranean Region, Central Anatolia Region, Eastern Anatolia Region, and Southeastern Anatolia Region. Each region has its own distinct climate, landscape, and flora and fauna. The results of the various climate change impact, extreme hazards and vulnerability and risk assessments are explained in these seven regions.

[18] 7th NC, 2019.

[19] Noah's Ark National Biological Diversity Database, 2024

Figure 2 - Geographical regions of Türkiye

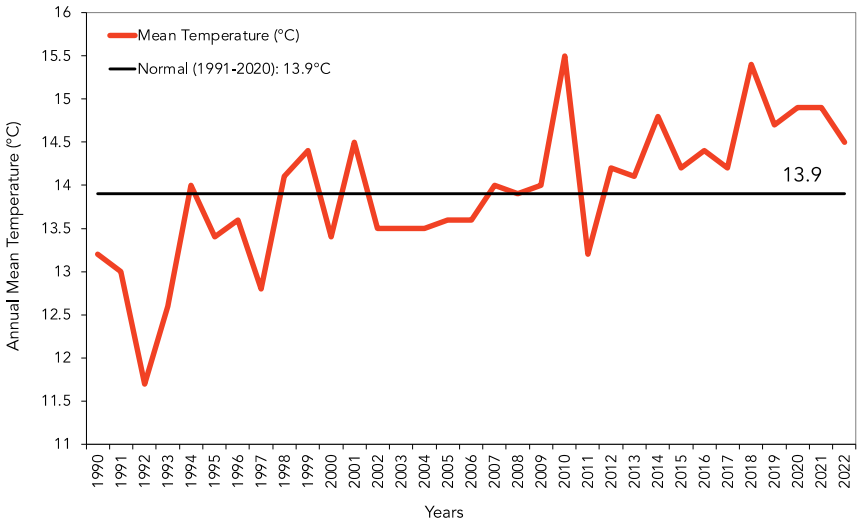
2.4 CLIMATE PROFILE

2.4.1 Temperature

The Turkish State Meteorological Service (TSMS) has reported that the long-term annual mean temperature in Türkiye has increased to 13.9°C during the new normal period of 1991-2020[20]. Observed temperature data from TSMS shows the year 2010 had the highest recorded temperature anomalies, with temperatures 1.6°C above average, while 1992 had the lowest, with temperatures 2.2°C below average as shown in Figure 3. Further elaboration on observed temperature changes can be found in Chapter 6.2.1.

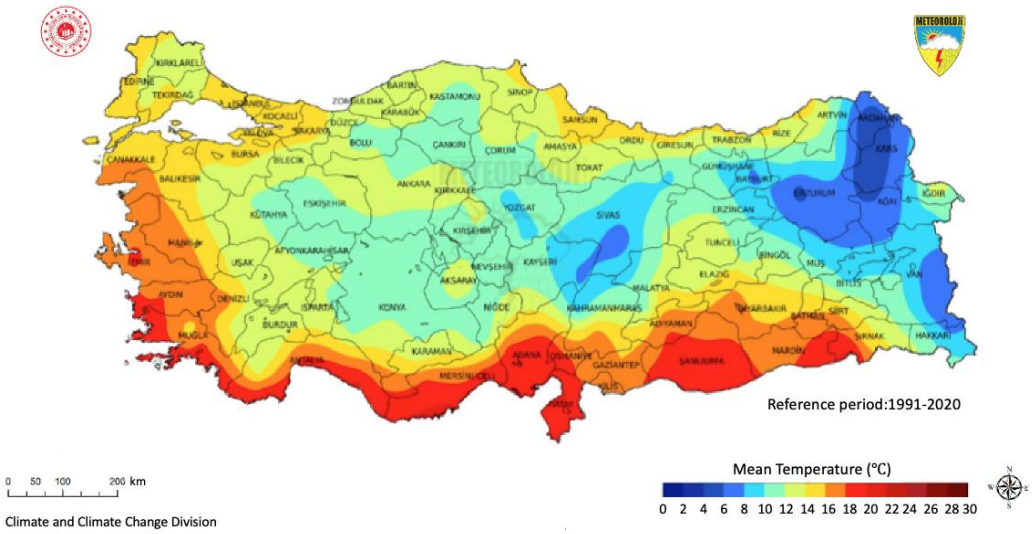
[20] TSMS, 2024. https://www.mgm.gov.tr/eng/Yearly-Climate/State_of_the_Climate_in_Turkey_in_2023.pdf

Figure 3 - Annual Mean Temperature in Türkiye



During the 1991-2020 period, the highest long-term average temperature in Türkiye were recorded in the Mediterranean, Southeast Anatolia, and Aegean regions as given in Figure 4. Specifically, average temperature values in cities such as Adana, Hatay, and Antalya in the Mediterranean region, Muğla and Aydın in the Aegean region, and Şanlıurfa and Mardin in Southeast Anatolia reach 18-20°C. In the Marmara region, the average temperature values range between 12-14°C, and as you move eastward towards Central Anatolia, the average temperature values decrease to 8-12°C. The Eastern Anatolia region, particularly the Northeastern Anatolia, experiences the lowest temperatures, approaching 0°C.

Figure 4 - Long-term Mean Temperature Distribution in Türkiye (TSMS, 2022)

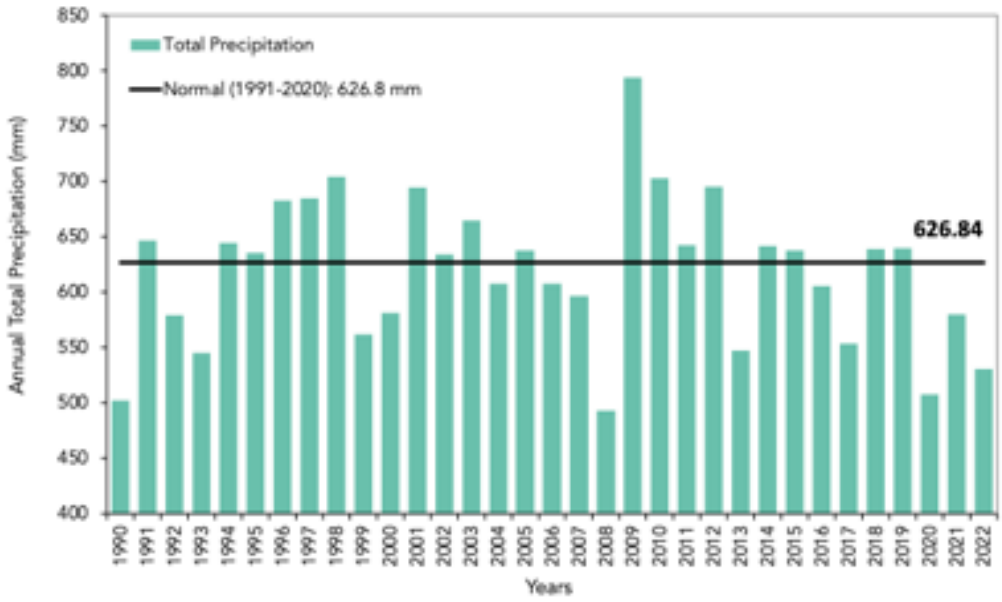


In 2023, the lowest temperature was -31.1°C in Erzurum in January, and the highest temperature was 49.5°C in Sarıcakaya/Eskişehir in July. Türkiye has reached a new maximum temperature record of 49.5°C. In 2023, while the mean temperatures in Türkiye are below the long-term mean in 1 centers; at 219 stations, it was above the long-term mean.[21]

2.4.2 Precipitation

According to the TSMS, the long-term annual mean areal precipitation in Türkiye between 1991 and 2020 was 573.4 mm. Analysis of the observed data indicates that the year 2009 had the highest recorded precipitation at 728.3 mm, which is 154.9 mm above the long-term average, while 2008 had the lowest recorded at 451.6 mm, which is 121.8 mm below the long-term average as shown in Figure 5 (TSMS, 2022). Türkiye's mean areal precipitation was recorded as 530 mm in 2022. Türkiye's mean areal precipitation was recorded as 641.5 mm in 2023. The amount is approximately 68.1 mm, below from the period of 1991-2020's normal (573.4).[22]

Figure 5 - Annual Total Precipitation in Türkiye (1990-2022)



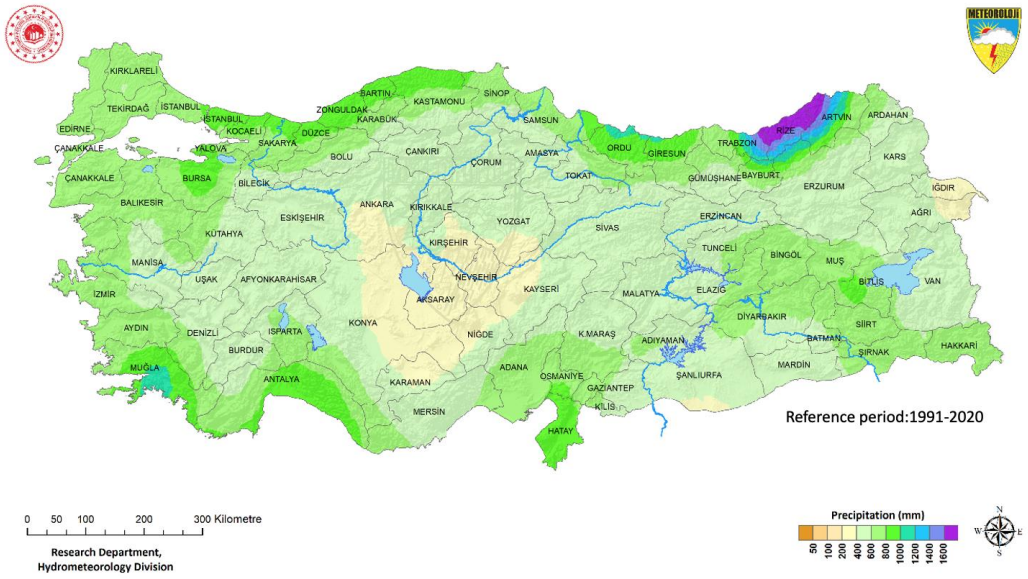
During the period of 1991-2020, the Eastern Black Sea Region had the highest total precipitation, while the lowest values were observed in the Central Anatolia and

[21] Ibid.

[22] Ibid.

Eastern Anatolia Regions as presented in Figure 6. Specifically, the total precipitation amount exceeding 1600 mm was observed over Artvin, Rize, and Trabzon in the Eastern Black Sea Region, while it was around 800-1000 mm following the Western and Central Black Sea and the Taurus Mountains. The Aegean Region had the highest precipitation amount reaching around 1000 mm over Muğla province. The lowest total precipitation in Türkiye was observed around 300 mm over Konya, Aksaray, Karaman, Iğdır, and Şanlıurfa provinces.

Figure 6 - Long-term Mean Total Precipitation Distribution in Türkiye (TSMS, 2022)

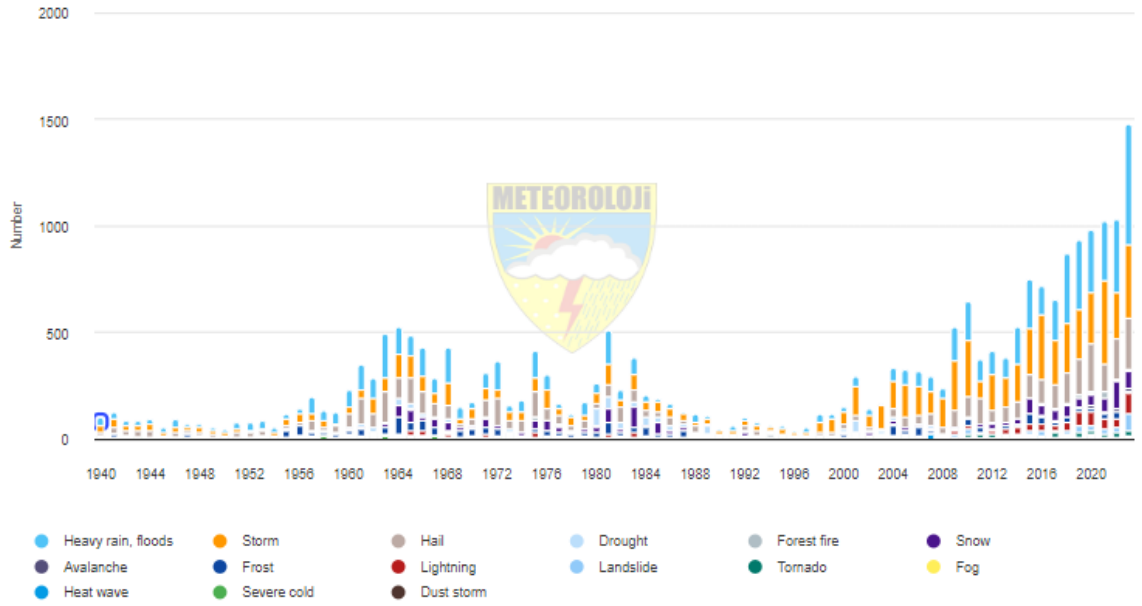


In Türkiye, the highest temperatures are generally observed in the summer season with the countrywide average reaching up to 25°C, while the lowest temperatures are typically experienced in the winter season, falling below 5°C. Türkiye receives the majority of its precipitation during the winter and spring seasons. During the summer, the amount of precipitation decreases, while the temperature and evaporation rates increase. This phenomenon results in the presence of water shortages in most parts of the country during the summer months, except for the Eastern Black Sea Region.

2.4.3 Extreme Weather Events

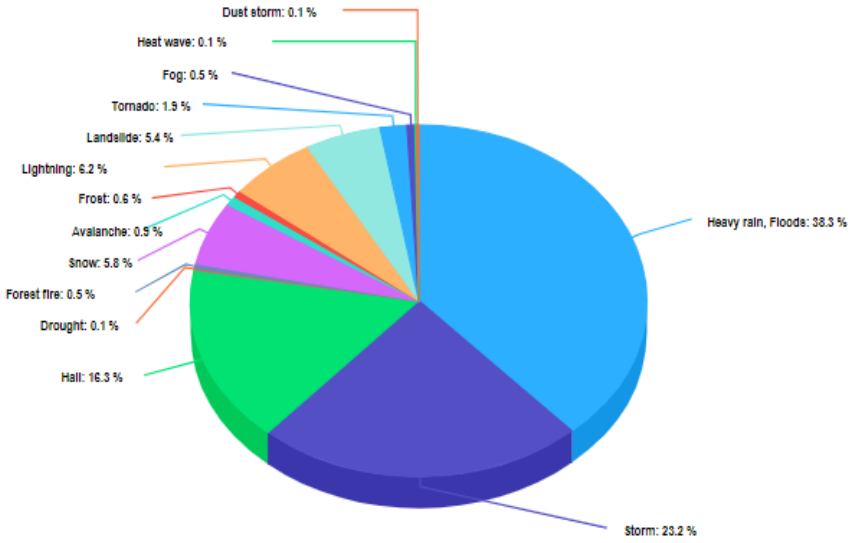
There has been a significant increase in the number of meteorological extreme events in Türkiye, particularly since 2000. A total of 1,475 meteorological natural disasters were reported in 2023 (Figure 7). The year 2023 saw the highest number of disasters since 1940 with a total of 1,475 disasters.

Figure 7 - Total numbers of annual extreme weather events in Türkiye (1940-2023)



The percentage of extreme events recorded in 2023 were heavy precipitation and floods (38.3%), windstorms (23.2%), hail (16.3%), lightning (6.2%), snow (5.8%), forest fire (0.5%), fog (0.5%), dust storm (0.1%), drought (0.1%) and extreme temperature (0.1%).

Figure 8 - Extreme weather events in 2023



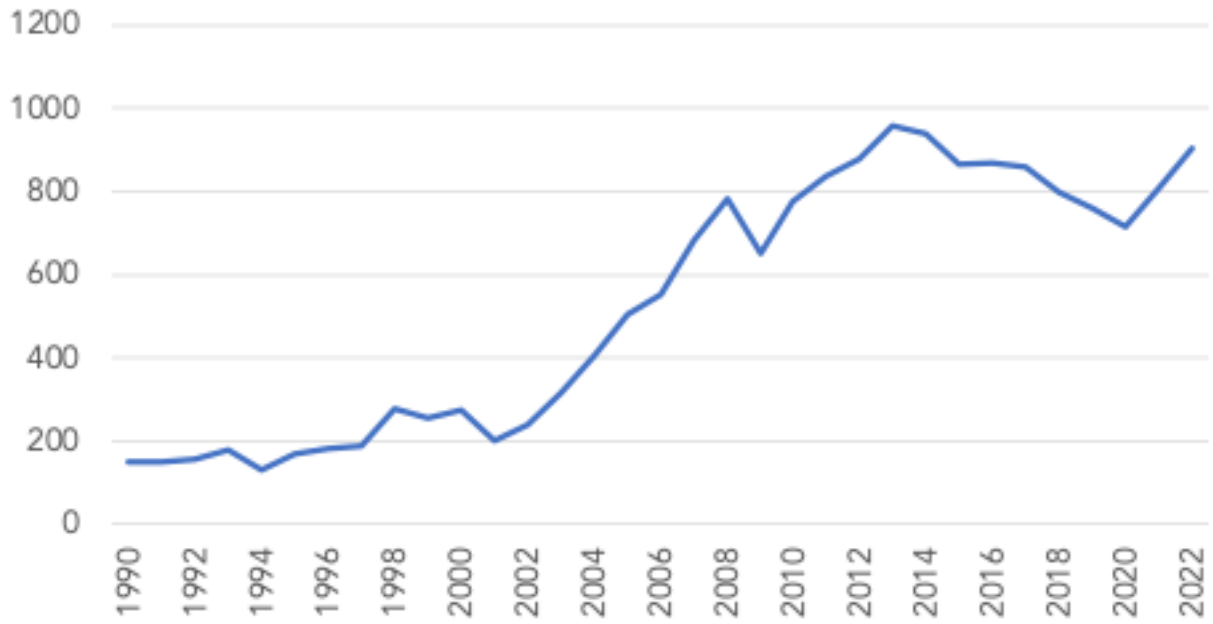
2.5 ECONOMIC PROFILE

Since 1990, Türkiye's macroeconomic outlook has been fluctuant based on regional and global conditions. Turkish economy demonstrated growth in the

1990-2013 period accepting economic crisis years of 1994, 2001, and 2008. Decreasing trend was observed in GDP during 2014-2020 period (see Figure 9) and it started to increase again in 2021 and 2022.

Türkiye's Gross Domestic Product (GDP) was 905.8 billion US Dollars in 2022. The per capita GDP in 2022 was USD 10,659. Industry's share and manufacturing industry's share in GDP became 26.4% and 22.1% in 2022, respectively. The share of agriculture, forestry and fishing in the GDP was 6.5%, and construction's was 4.9%.[23]

Figure 9 – GDP, Billion USD, 1990 – 2022[24]

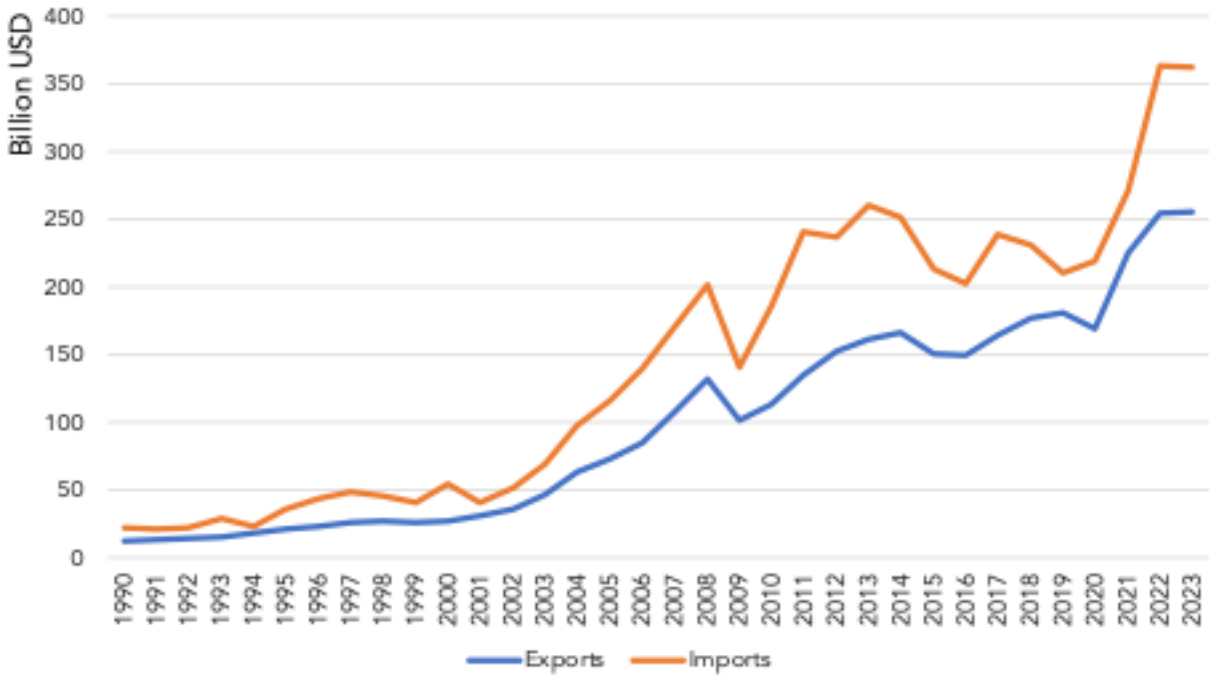


According to the targets of the Medium-Term Programme (MTP) 2023-2025, Türkiye aims to grow 5.0%, 5.5% and 5.5% for successive three years.[25] With regard to the estimates of OECD, in the period of 2023-2024 Türkiye will have annual growth rates of 2.8% and 3.8%.[26] Economic growth is the main driver of Turkish anthropogenic GHG emissions. GHG emissions are expected to increase in parallel to the GDP growth in the next decade.

[23] Data source: TurkStat, 2023_b.
[24] Data source: TurkStat, 2023_b.
[25] MTP, 2021.
[26] OECD, 2024.

Türkiye had an overall trade value of 617.6 billion USD in 2023, 255.6 billion USD coming from exports and 362.0 billion USD from imports. Turkish foreign trade value has grown in the periods between 1990-2013 except economic crisis years of 1994, 2001 and 2009. Both the imports and exports values of Türkiye increased. The value of trade decreased in the period between 2014-2020. Since then, following the Covid-19 pandemic, the volume of trade increased 1.6 times in 2023 compared to 2020. Foreign trade deficit increased from 9.3 billion USD in 1990 to 106.3 billion USD in 2023. The highest 3 value of export in 2023 was vehicles other than railway or tramway rolling-stock, parts thereof, boilers, machineries and mechanical appliances, parts thereof and mineral fuels, minerals oils and product of their distillation. The highest 3 volumes of import in 2023 were mineral fuels, minerals oils and products, boilers, machinery and mechanical appliances and precious stones, precious metals, pearls and articles thereof.[27]

Figure 10 - Foreign trade, 1990-2023[28]



Climate mitigation policies, such as the EU's Carbon Border Adjustment Mechanism (CBAM) that will be effective from 2026, will have economic and

[27] Data source: TurkStat, 2022_b.

[28] Data source: for 1990 to 2012 data: TurkStat, 2016 and 1985 – 2015 for 2013 to 2020 data: TurkStat, 2023_c.

social consequences on Türkiye's GDP and Turkish exports into the European Union (EU), and will negatively affect the development of Turkish economy.

While Türkiye's exports to EU countries in 2023 in products covered by CBAM were approximately 9.7 billion USD, Türkiye's exports to the world in these products were 23.3 billion USD. In this context, Türkiye's exports to the EU in the mentioned products in 2023 had a 42% share in our exports to the world, and the data regarding our exports in 2023 in product groups covered by CBAM.

Table 4 - Türkiye's Exports in 2023 in product groups covered by CBAM

Products	Exports to the EU (Thousand USD)	Exports to the World (Thousand USD)	EU's Share in Total Exports (%)
Iron and Steel	6,253,035	16,163,723	%39
Aluminum	3,016,321	5,110,204	%59
Cement	232,996	1,366,824	%17
Fertilizer	99,990	476,383	%21
Electricity	149,041	207,396	%72
Hydrogen	8	51	%17
List Total	**9,751,391**	**23,324,581**	**%42**

Source: TÜİK

Due to the high share of the EU in Türkiye's exports and Türkiye's position as one of the EU's major suppliers, especially for iron and steel, cement and aluminum; it is anticipated that we will be among the countries most affected by the regulation.

Studies conducted on the effects of CBAM on Türkiye also show that if mitigation measures that will ensure our competitiveness in terms of emission intensity are not taken, there may be export contractions approaching 9% in our iron and steel sector and exceeding 20% in our cement sector during the period when the costs of CBAM are fully realized. In particular, the introduction of indirect emissions originating from electricity consumption appears to be the main element behind the effect in the iron and steel and aluminum sectors.

2.6 ENERGY INDUSTRIES

In the last 5 years (2017-2022), total electricity demand has increased by 11%. The installed power capacity of Türkiye increased more than threefold in the last two decade and reached 103,809 MW as the end of 2022. In the period between 2017-2022, the installed power of renewable energy sources increased by 55%, while there was an increase of 5% in fossil fuel sources. Total additional renewable energy installed capacity was 4,045 MW in 2021, it became 2,766 MW in 2022. The share of solar and wind electricity generation in total production has exceeded 15% in 2022[29]

Türkiye's Energy Policy gives top priority to decreasing import dependency by improving security of supply and utilizing renewable energy sources to the maximum extent in an environmentally sound manner. Therefore, the priority of Türkiye in the forthcoming period will be reducing dependency on imports by realizing its domestic and renewable energy potential along with providing energy supply security. In this context, Türkiye's main strategies and policies based on the energy supply security are outlined as:

- Providing resource diversity by prioritizing local resources,
- Increasing the share of renewable energy resources in energy supply,
- Increasing energy efficiency,
- Introducing nuclear energy for electricity generation,
- Giving full operability to free market conditions and improving the investment environment,
- Providing resource diversity in oil and natural gas fields and taking the measures to mitigate the risks arising out of import,
- Becoming an energy hub within the context of regional collaboration processes using the geostrategic position effectively,
- Providing for environmentally sensitive execution of activities in energy and natural resources,
- Increasing contribution of natural resources to the country's economy,
- Increasing production of industrial raw materials, metal and Non-metal minerals and providing for their domestic use,
- Making energy accessible for consumers in cost, time and amount aspects.

[29] TEİAŞ, 2023_a.

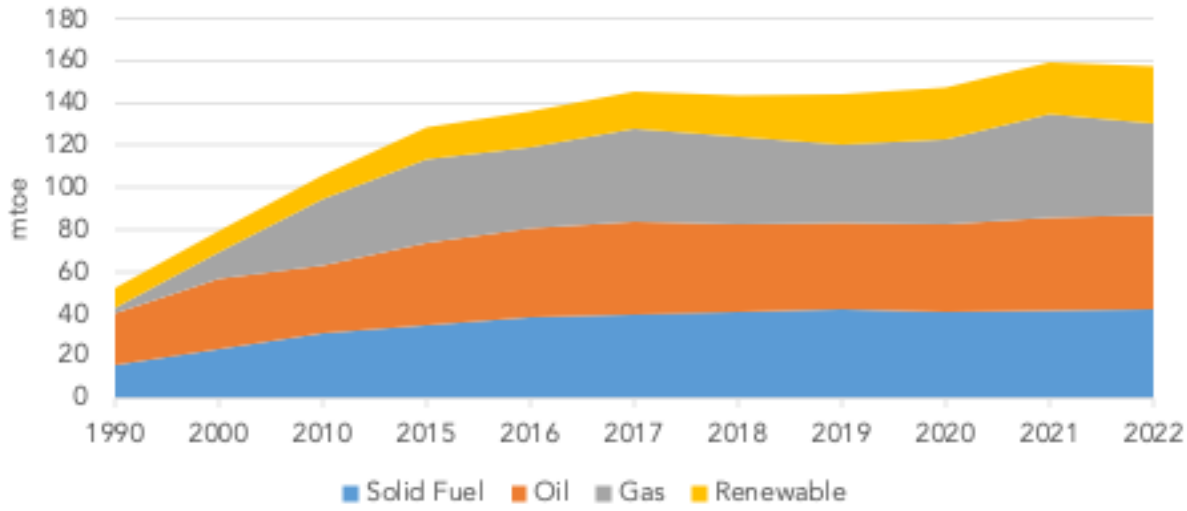
2.6.1 Primary Energy

2.6.1.1 Production from Primary Energy Resources

Türkiye has the highest rate of energy demand growth among OECD countries over the last 15 years. Growing economy, population increase, urbanization has led to an increased demand of energy. The domestic energy resources of Türkiye, especially in terms of oil and natural gas reserves are quite limited and are not adequate to meet the national demands. Türkiye was able to meet only around 30% of its total energy demand from its own domestic resources in 2022. Türkiye is dependent on imported fuels, and 90.9% of the oil supply and 99.2% of the natural gas supply is imported. Energy import dependency is increasing due to the growing energy demand.

Total primary energy supply was 52.5 Mtoe in 1990 and increased to 157.7 Mtoe in 2022 (with 203% increase). The share of fossil fuels in total primary energy supply was 82% in 1990, and 82.7% in 2022.The share of renewables, on the other hand, was 17.2% in 2022 (See Figure 11).

Figure 11 - Primary Energy Supply 1990-2022[30]



Total installed power capacity of Türkiye increased sixfold since 1990 and reached to 103.8 GW in 2022 and it is expected to reach 189.7 GW by 2035. The share of domestic resources in total installed power capacity was around 65% in 2022.[31]

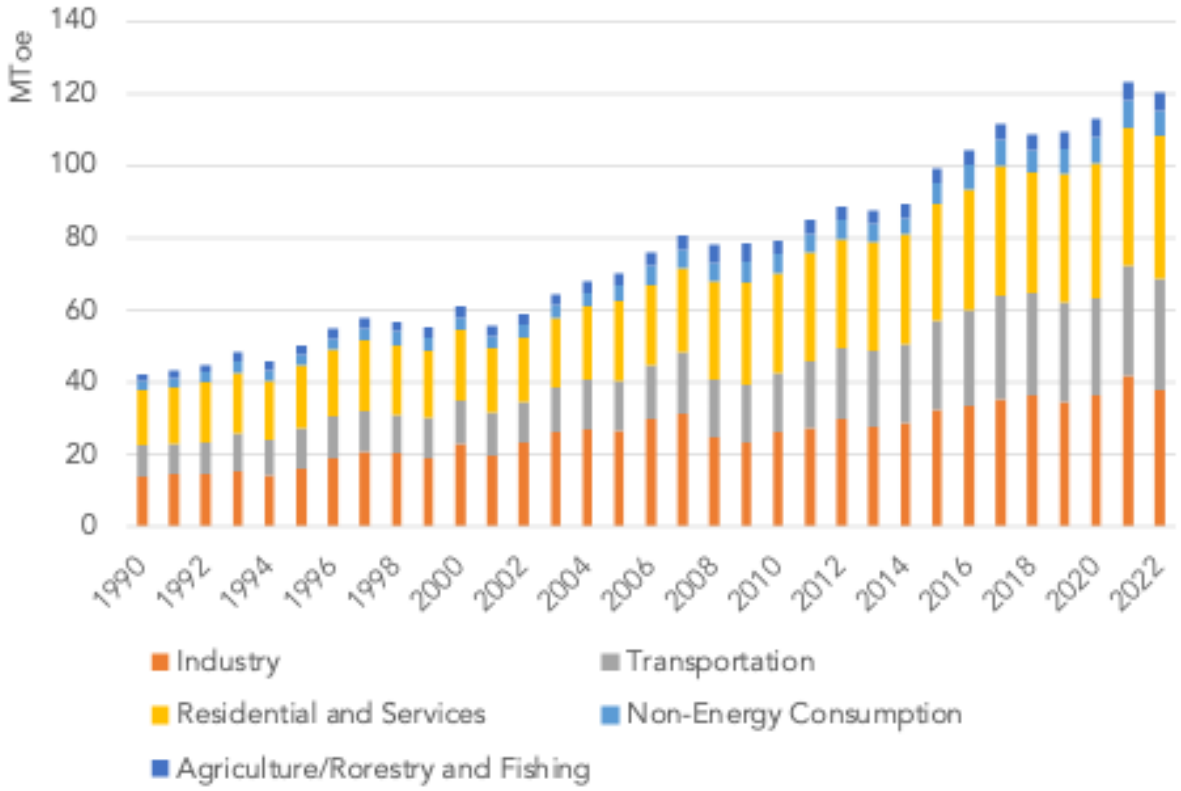
[30] Data source: MENR, 2022.

[31] TUEP, 2022.

2.6.1.2 Consumption of Primary Energy Sources

Final energy consumption of Türkiye increased from 42.2 Mtoe in 1990 to 120.4 Mtoe in 2022. Although energy consumption has risen from 1990 to 2022, in periods of economic crisis (i.e. 1994, 2001 and 2008) clear decreases were observed especially for industrial sector (see Figure 12).

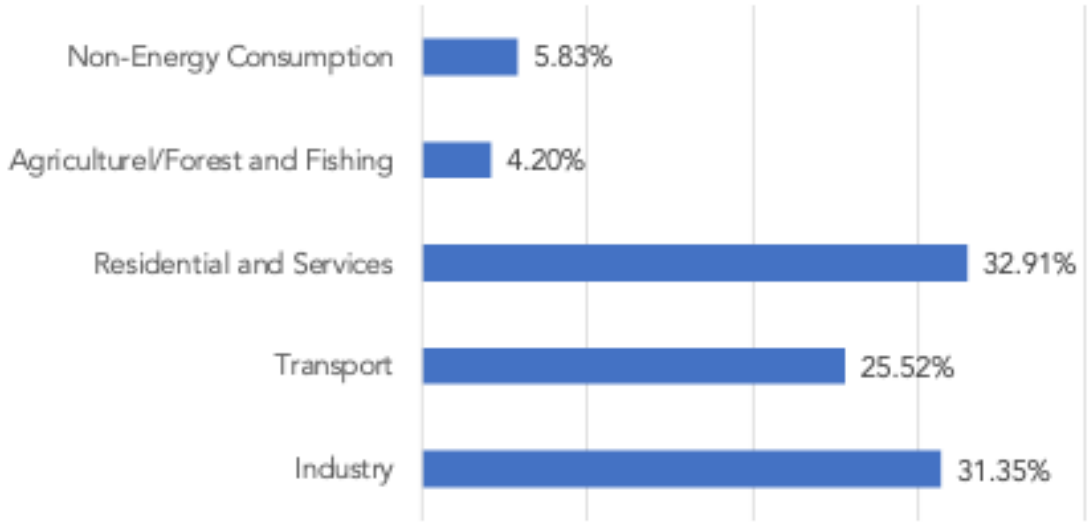
Figure 12 - Final energy consumption by sector, 1990-2022[32]



Industrial sector and buildings sectors are the highest energy consuming sectors and accounts for around 60% to 70% of final energy consumption. In 2022, the industrial sector accounted for 31%, residential and services for 33%, transportation for 26%, non-energy consumption for 6%, and agriculture for 4% of the final energy consumption. (see Figure 13)

[32] Data source: MENR, 2022.

Figure 13 - Distribution of final energy consumption by sectors (%), 2022[33]



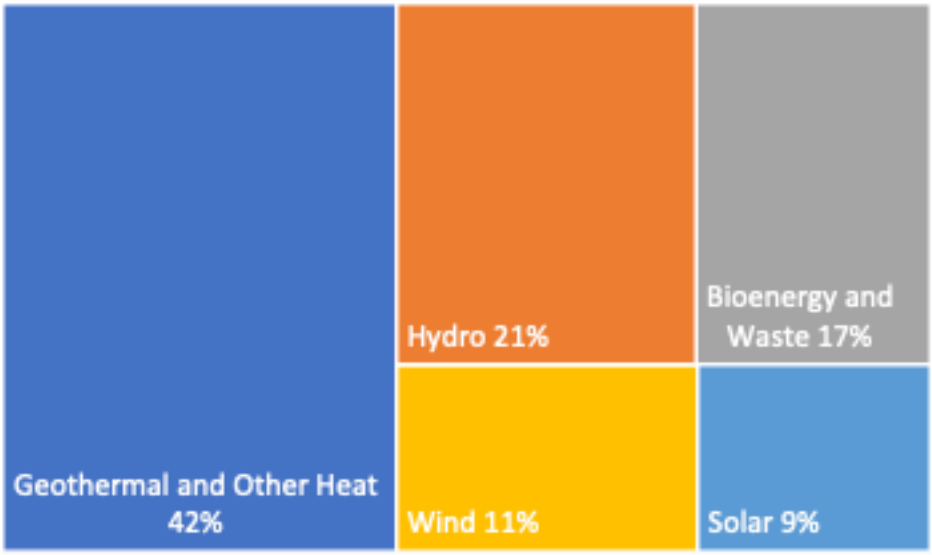
Renewable Energy Sources

As the demand for energy grows in Türkiye, utilization of renewables for electricity generation appears to be one of the most efficient alternatives in meeting the growing demand for electricity. The share of renewable energy in the total electricity installed capacity has reached 55% in Türkiye as of the end of 2022. With this ratio, Türkiye ranks 5th in Europe and 12th in the world. Having 11% of the global geothermal power, Türkiye is the 1st in Europe and the 4th in the world. In hydraulics, it is the 2nd in Europe and the 8th in the world. 97% of the 9,000 MW power commissioned in 2020 and 2021 were renewable, the rest is cogeneration, which is a best practice of efficiency.

In 2022, 17.2% (27 Mtoe) of Türkiye's total primary energy supply was met by renewable energy sources. As of the end of 2022, 16.7% of the renewable energy supply in Türkiye was from biomass sources, 21.2% from hydraulic sources, 42.5% from geothermal sources, 11.1% from wind, and 8.6% from solar energy. (Figure 14)

[33] Data source: MENR, 2023

Figure 14 - The share of Renewable energy by energy resources, 2022[34]



2.6.1.3 Wind Energy

According to the **Wind Energy Potential Atlas**, the potential of Türkiye is nearly 140,000 to 150,000 MW; 20,788 MW of which is offshore[35]. Wind power-based electricity generation facilities in Türkiye have been increased. The wind power plant capacity which used to be 18.9 MW in 2002 reached to 11,396.16 MW in 2022.[36]

EMRA licensed projects with a total capacity of 9,940.25 MW until the end of 2017. As of May 2018, the total of 239 licensed projects correspond to 10,536.41 MW.

Following the enforcement of the By-Law on Renewable Energy Resource Areas (YEKA), in 2019, 4 YEKA WPP Competitions, each with a capacity of 250 MW, were held in Aydın, Çanakkale, Muğla and Balıkesir provinces for the allocation of a total capacity of 1,000 MW. The latest YEKA WPP competitions were held in 2022 to include 20 tenders for the allocation of a total connection capacity of 850 MWe in 20 to 80 MWe capacities. Within the scope of YEKA WPP, 65 MWe were commissioned as of August 2024. In order to make maximum use of Türkiye's wind power potential, to ensure integration of more wind farms to electricity system and to predict the electricity power to be generated from wind, a By-Law published in 2013 introduced the condition of connecting all wind power plants to Wind Power Monitoring and Forecasting System (RITM). In this framework, 243

[34] MENR, 2022.
[35] MENR, 2022.
[36] TEİAŞ, 2023_b.

wind power plants with a capacity of over 10 MW have been connected to the RITM (83% of the installed power, total installed power 10,976 MW). Power generation of operational WPPs can be simultaneously monitored and power generation for 48 hours can be forecasted. Moreover, the activities with the aim of reducing forecast error ratio for the electricity generated from wind are in progress within the scope of the RITM Project.[37]

2.6.1.4 Solar Energy

Türkiye, judging by its geographical location on the globe, is situated in one of the most advantageous regions in terms of benefiting from solar energy, which is called the solar belt. According to **Türkiye's Solar Energy Potential Atlas (GEPA)** prepared by the MENR, total annual insolation time is 2,737 hours (total of 7.5 hours per day) and total annual solar energy derived is 1,527 kWh/m2 (total of 4.2 kWh/m2 per day).[38] The installed capacity of solar energy is 9,425 MW at the end of 2022 and expected to increase to 52,900 MW according to TUEP.[39]

Within the framework of YEKA initiative, the first tender was awarded in May 2017 for the construction of a 1 GWe solar power plant (SPP) with an estimated USD 1.3 billion total investment. The solar plant will be operational for 30 years meeting the electricity demand of over 600,000 households. The tender also included a commitment to conduct R&D activities in Türkiye for a minimum of 10 years, employment of at least 80% local staff, and construction of an integrated factory for production from ingot to photovoltaic module. The country's first solar module manufacturing facility, based on investment of USD 400 million and with an annual capacity of 500 MWe, opened in August 2020 in Ankara's Başkent Organized Industrial Zone, employing around 1400 people. In 2021, by the 74 YEKA SPP Competitions covering 36 provinces, 1000 MW of connection capacity were allocated as 10, 15 and 20 MW.. The latest YEKA SPP Competitions for 300 MWe capacity in Niğde (Bor-1, Bor-2 and Bor-3 Competitions, 100 MWe each), were held on 8 April 2022. Remaining 700 MWe capacity were allocated by 2 Erzin (Hatay) and 10 Viranşehir (Şanlıurfa) Competitions as 50 and 100 MWe capacities. Tenders were held on 28 June 2022. In the context of YEKA SPP, 1270 MWe were commissioned as of August 2024.

[37] http://www.ritm.gov.tr/root/index_eng.php

[38] MENR, 2022.

[39] TUEP, 2022.

2.6.1.5 Geothermal Energy

Türkiye has a high potential in terms of geothermal energy resources. Geothermal energy is a significant domestic and renewable energy source for the Country due to its intensive tectonic movements. Theoretically speaking, the geothermal potential of Türkiye is 35,500 MWt and 12.6% of this potential is again theoretically expected to be suitable for electricity generation. Even though the technical potential for generating electricity from geothermal sources is estimated to be 4,000 MW, the total installed power in Türkiye reaches to 1,691 MW as of the end of 2022.[40] Geothermal utilization in Türkiye can be represented by a remarkable increase especially in electricity production. As of December 2022, there are 63 operating geothermal power plants at 26 geothermal fields in Türkiye consisting of this installed capacity. By the amendment on Electricity Market Law No. 6446 on 1 July 2022, technical evaluation has been obligatory for geothermal power plants.

Judging by the temperature of current springs and falls in Türkiye, 14% of geothermal energy is used for heating purposes (greenhouse, residential areas, plants, etc), 4% for thermal tourism, and 82% for electricity generation. The share of the capacity is located as 79% in Western Anatolia, 8.5% in Central Anatolia, 7.5% in Marmara Region, 4.5% in Eastern Anatolia and 0.5% in other regions.

The heat potential in Türkiye is estimated to be 16,098 MWt, out of which 3,800 MWt is used for heating purposes. However, the utilization of available resources is observed to be around 10%, given the total potential. In Türkiye, there are 18 settlement units which use geothermal energy in the heating systems, which corresponds to approximately an equivalent of central heating for 140,000 houses.

2.6.1.6 Hydraulic Energy

Türkiye's gross theoretical hydropower potential is 433 billion kWh. However, as it is not possible to use the whole potential with the existing technologies, technically feasible potential is about half of this amount (which is at 216 billion kWh). Further limitation is the fact that each facility that can technically be constructed may not be very cost friendly. Therefore, the more realistic potential is closer to 160 billion kWh/year. Türkiye has about 2.3% of the world's economically viable hydropower potential and about 17% of Europe's total potential.

[40] MENR, 2022.

As of the end of 2022, there were 751 hydropower plants, with the total capacity of 31,571MW. This is the equivalent of 30.44% of the total capacity. In 2022, hydroelectricity production has been increased to 66.7 billion kWh which means 20.4% of the Country's electricity production was obtained from hydropower. Additional hydropower plants are currently under construction, further helping Türkiye to meet the potential for enhanced hydropower development. The installed capacity of hydro is expected to increase 35,100 MW according to TUEP.[41]

2.6.1.7 Biomass Energy

The **Biomass Energy Potential Atlas (BEPA)** prepared by MENR for identifying biomass potential of Türkiye. According to the Atlas, the biomass potential is identified, in theory, as 34 Mtoe. The amount of usable biomass energy potential is approximately 3.9 Mtoe. The amendment on Electricity Market Law No. 6446 on 1 July 2022 gets technical evaluation for biomass power plants. Until 2011 there were only a few biomass plants, producing energy from wastewater, the number of plants generating energy from various biomass sources reached 384 with the total capacity of 1,921 MWe as of the end of 2022.[42]

In order to decrease import dependency, to increase diversity of supply and to progress the approximation process to EU Acquis, the rules and procedures on blending ethanol produced from local agricultural products into gasoline and diesel have been regulated. According to the data of Energy Market Regulatory Authority (EMRA), the installed bioethanol capacity in Türkiye is 152.0 million liters with three active facilities. The total amount of bioethanol production in the year of 2023 was 65,773.04 tons. The installed biodiesel capacity in Türkiye is 239,715 tons and the total amount of biodiesel production in the year of 2023 was 101,016,12 tons according to the data of EMRA.

The biogas production (collected gas) on landfills and wastewater treatment was increased in the recent years. In total, 333.9 kt methane was collected in 2020 from solid waste sites and wastewater facilities. (see Section 2.10)

2.6.2 Waste Heat

Within the scope of the National Energy Efficiency Action Plan objectives, the **"Türkiye Waste Heat Potential Evaluation Project"** have been conducted in cooperation with the World Bank in order to determine the waste heat potential

[41] TUEP, 2022.

[42] (MENR, 2022.

of Türkiye and to prepare the necessary arguments for converting this potential into an enterprise-based investment. Studies have been carried out to assess the waste heat market in Türkiye, identify technically and financially viable waste heat recovery investments and existing barriers against implementation of waste heat recovery investments and develop sample/templates for energy audit within the scope of the project.

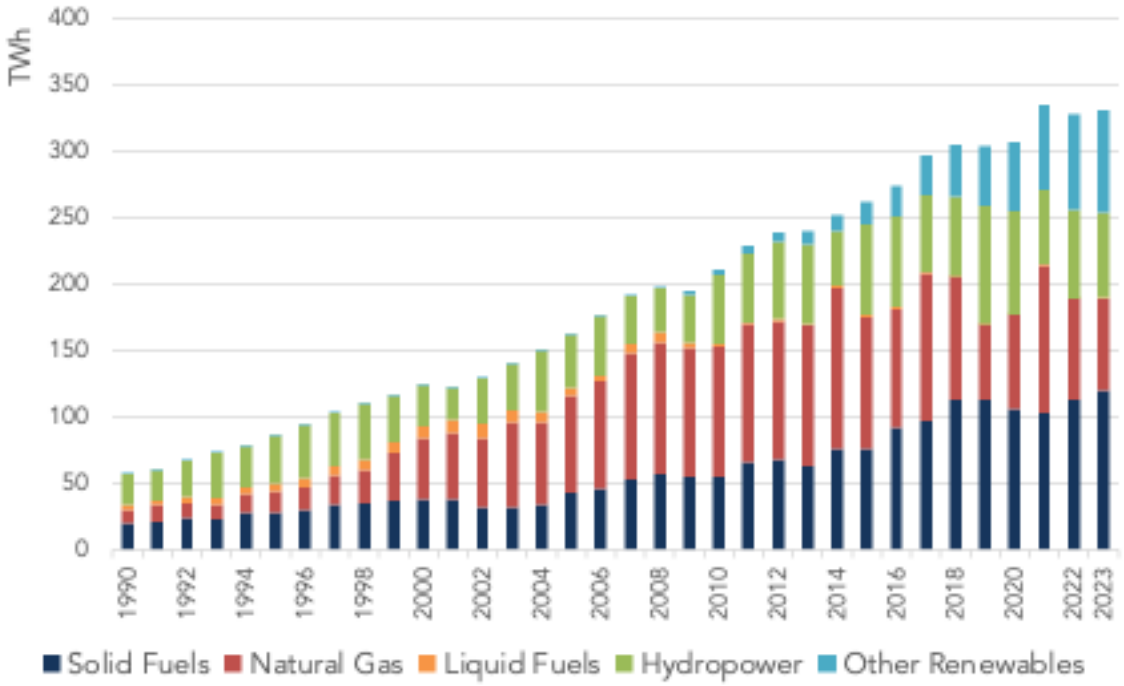
A total of 18 energy audit focusing waste heat have been done in industrial enterprises, buildings and thermal power plants, the final energy consumption information of the sectors from the database of our MENR and the chimney temperature and flow rate information of 340 industrial enterprises from the database of the MoEUCC have been used in order to determine the waste heat areas. In addition, information was gathered by holding consultation meetings with sector representatives and institutions. After the waste heat potential was determined with the top-down methodology in the light of the collected data, it was analyzed by comparing it with the potential that emerged with the bottom-up methodology as a result of the studies carried out in the enterprises.

As a result of the studies, 66,000 TJ/year at the rate of 11% of the final consumption of the industrial sector, 29,000 TJ/year at the rate of 5% of the final consumption of the building sector, and 65,000 TJ/year at the rate of 5% of the final consumption of the thermal power plants. In total, a theoretical waste heat potential of 160,000 TJ/year has been determined. It has been calculated that an investment of 2.4 billion dollars will be needed in order to bring the identified potential to the economy. With the acquisition of the potential, 10 MtCO2/year emissions corresponding to 4 million vehicles can be prevented.

2.6.3 Electricity Sector

According to the latest national GHG inventory, the total CO2 emission released by the energy sector in 2020 was 367.6 million tons of CO2 eq. and 142.93 million tons of this was attributable to the electricity sector. Installed power capacity increased from 16,318 MW in 1990 to 103,809 GW at the end of the 2022. Annual electricity production grew from 57.5 TWh to 326 TWh during the same period. The share of hydropower was 20.5%, other renewables were 21.2%, natural gas was 21.9%, liquid fuels were 1.1%, and the percentage of solid fuels was 35.0% in the electricity production in 2022.

Figure 15 - Electricity generation by primary energy resources, 1990-2023[43]

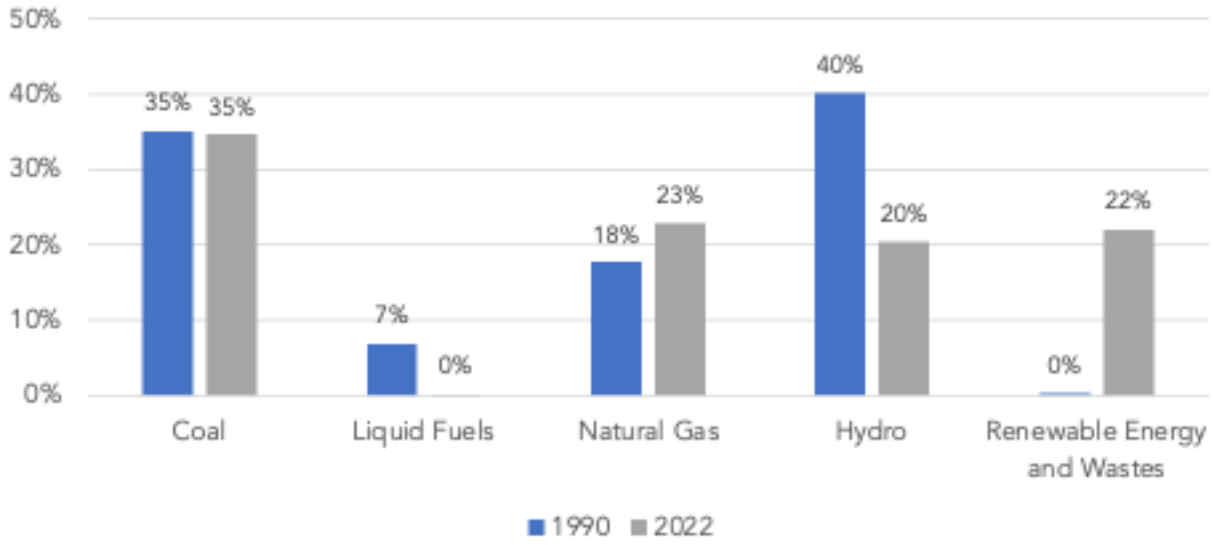


In 2022, hydropower accounted for a significant share of 20.3%. The shares for other energy sources were as follows: natural gas at 22.9%, coal at 34.6%, other renewables and waste at 22%, and oil at 0.1%. Due to weather conditions, electricity production from hydropower plants decreased in 2021 but increased again by 19% in 2022. However, it remains below the peak level reached in 2018 and is also lower than the production level in 2019.

In 2022 electricity production from fossil-fueled thermal power plants has accounted for 198.845 TWh of 328,149 TWh total electricity production, while in 2021, electricity production from fossil-fueled thermal power plants had accounted for 222.624 TWh of a total of 334.723 TWh total electricity production. Fossil fueled thermal share in electricity production significantly decreased from 64.2% in 2021 to 57.6% in 2022.

[43] Data source: TEİAŞ, 2023_b.

Figure 16 - Electricity generation and shares by energy resources, 1990 – 2022



Renewable Law, which came into force in 2005 later revised in 2011, provided some supporting mechanisms for purchasing electricity from solar, biomass, geothermal, wind, and hydraulic energy. Wind installed capacity increased from 10,607 MW in 2021 to 11,396 MW in 2022. In the same year, the installed capacity of solar power plants rose to 9,425 MW, marking a 21% increase compared to 2021. Over the past five years, the installed capacity of solar power plants has nearly tripled.

The **National Renewable Energy Resource Guarantee System**, i.e. YEK-G System, and Organized YEK-G Market was opened on June 2021 under the operation of Energy Exchange Istanbul (EXIST/EPİAŞ). The By-Law on Renewable Energy Resource Guarantee System (YEK-G System) has been prepared by EMRA and entered into force on June 1, 2021. Moreover, procedures and principles for the operation of the YEK-G system and organized YEK-G market was also published in the Official Gazette on May 8, 2021. The YEK-G system and organized YEK-G market started operation on June 21, 2021 under the operation of EXIST (market operator of Türkiye). The system enables the trade of YEK-G certificates issued for each 1 MWh green energy generation from renewable power plants. YEK-G certificates are tradeable within licenced market players by bilateral agreements and also on the organized YEK-G market. The system framework and certificate properties were designed similar to the EU's Guarantees of Origin system. The YEK-G system also complements the ongoing green tariff (YETA) in the matter of proofing the green electricity generation.

2.6.4 Energy Efficiency

The main framework of energy efficiency efforts in Türkiye was outlined with the Energy Efficiency Law (No. 5627), which came into effect in 2007. The Energy Efficiency Strategy Document (2012-2023) that was published in 2012, aimed to reduce Türkiye's energy intensity (energy consumed per unit of GDP) by at least 20% by 2023 compared to 2011. As a roadmap for the efforts in the country towards 2023, the National Energy Efficiency Action Plan (2017-2023) was prepared and enforced on January 2, 2018.

In the National Energy Efficiency Action Plan (2017-2023) the importance of sustainable development along with competitive and green growth has been a topic of interest. Thereby, Turkish primary energy consumption will be reduced by 14% (23.9 Mtoe) and a cumulative saving of 66.6 million tons CO2 emission is expected by 2023 through an investment of 10.9 billion USD. The efforts conducted within the scope of the National Energy Efficiency Action Plan (NEEAP) between 2017 and 2023 involved an investment of 8.47 billion dollars, leading to 24.625 Mtoe of energy savings and a reduction of 68.62 million tons of CO2 equivalent emissions. Additionally, approximately 45,000 new green jobs were created in the sector.

As of 2022, Türkiye's primary energy intensity was calculated as 0.132 tep/GDP at constant 2015 prices. In 2022, there was a 6.2% improvement in primary energy intensity compared to the previous year and a 31.2% improvement compared to the year 2000. Over the period 2000-2022, an annual average reduction of 1.7% in primary energy intensity was achieved.

The 2nd National Energy Efficiency Action Plan (2024-2030) was developed and announced to the public on January 8, 2024, with the aim of achieving Türkiye's new energy efficiency vision and strategy.

To reach the set targets by 2030, a total investment of 20.2 billion dollars is expected from both the public and private sectors. Over the period 2024-2030, it is projected to achieve cumulatively 37.1 Mtoe of energy savings and a reduction of 100 million tons of CO2 equivalent emissions.

As per the Presidential Circular dated in 2019, energy saving target is set by 15% in public buildings until 2023 in order to use public resources efficiently and to reduce the burden of energy costs on the public sector. Public buildings which have total construction area over 10,000 m2 or total annual energy consumption over 250 toe, are in scope. In the period of 2019-203 more than 71,000 toe energy saved which has a monetary return of 1.5 billion TL per year. It has been observed

that savings of over 30% can be achieved in buildings where comprehensive energy efficiency improvements have been implemented. A guide explaining successful implementations has been published on the MENR's website. Considering the successful applications the current savings target has been updated with the Presidential Circular No. 2023/15 to be 30% by 2030. The "Savings Target and Implementation Guide in Public Buildings (2024-2030)", which defines the work and transactions to be carried out within this scope, has been published on the MENR's official website.

Also, an article related to EPCs, which allow EE implementations in public buildings and facilities through ESCOs, added into the EE Law in 2019. Relevant templates, guidelines and secondary legislation documents were made by the Ministry and published at the institutional website (www.enerji.gov.tr). Projects have begun to be implemented with the energy performance contract model by different public institutions.

2.7 BUILDING STOCKS AND URBANIZATION

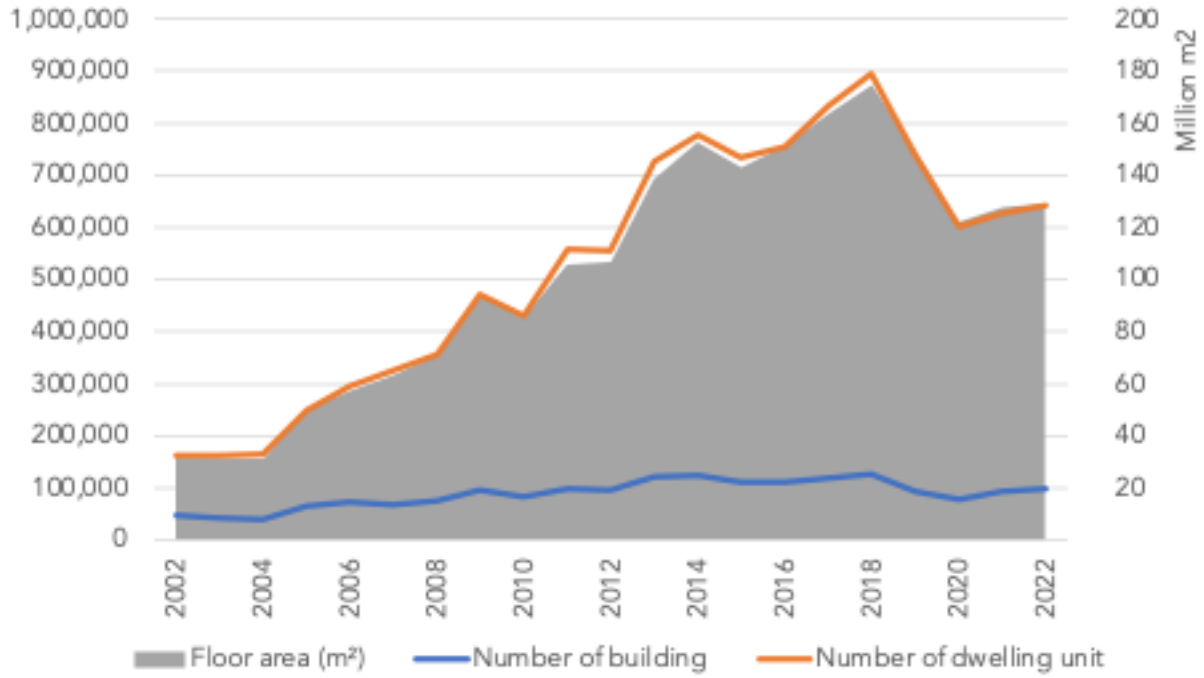
Türkiye has a high rate of urbanization with a rapid annual urban population increase. The urban population increased from 32.5 million to 79.6 million during the 1990-2022 period. A high rate of urbanization leads to a fast-growing building stock and an intensive need for transportation in cities. The buildings sector in Türkiye, which contains residential, commercial and public buildings, was responsible for 33% (39.6 Mtoe) of the country's total energy consumption in 2022.[44]

According to the building census results, the number of buildings in Türkiye grew from 4.3 million in 1984 to 7.8 million in 2000, and the number of dwelling units in the same period reached 16.2 million, reflecting an increase of 129%. The construction sector has been growing rapidly. According to building permit statistics, the majority of new buildings were constructed after 2002. In total, 47 thousand new buildings with a total floor area of 31.7 million m2 were constructed in 2002. In 2022, 99.2 thousand new buildings with a floor area of 129.0 million m2 were constructed (See Figure 17). During the 2002-2022 period, while the annual number of new buildings increased by 143%, the annual number of new dwelling units increased by 289% and the annual floor area of new buildings increased by 316%. Occupancy permits peaked in 2018 but declined during the COVID-19 pandemic. However, they have started to increase again in the past two years.

[44] Data source: MENR, 2022.

At the beginning of 2022, Türkiye's building stock, which totaled 8.1 million, consisted of 6.8 million residential buildings and 1.3 million non-residential buildings. Approximately 75% of these buildings were constructed before the year 2000.

Figure 17 - Number of new buildings' occupancy permit by year (2002-2022)[45]

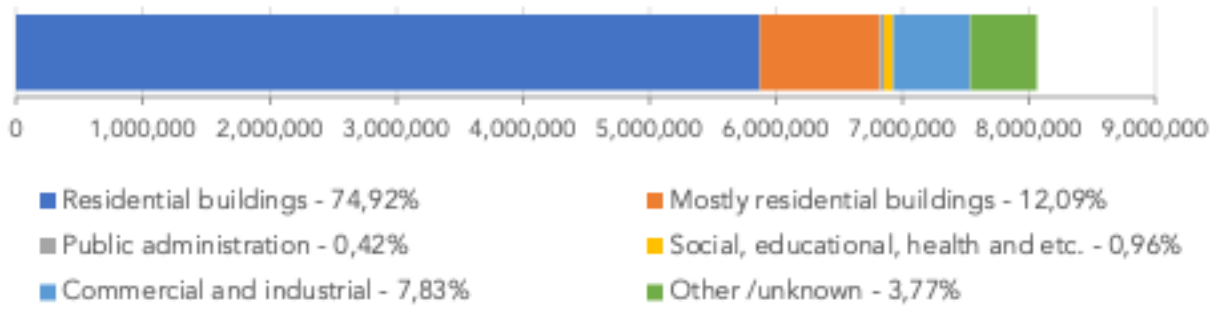


The share of residential buildings is 86% of the total building stock, followed by commercial buildings. Public buildings are the smallest category of the stock (Figure 2.17).[46]

[45] Data source: TurkStat, 2022_b.

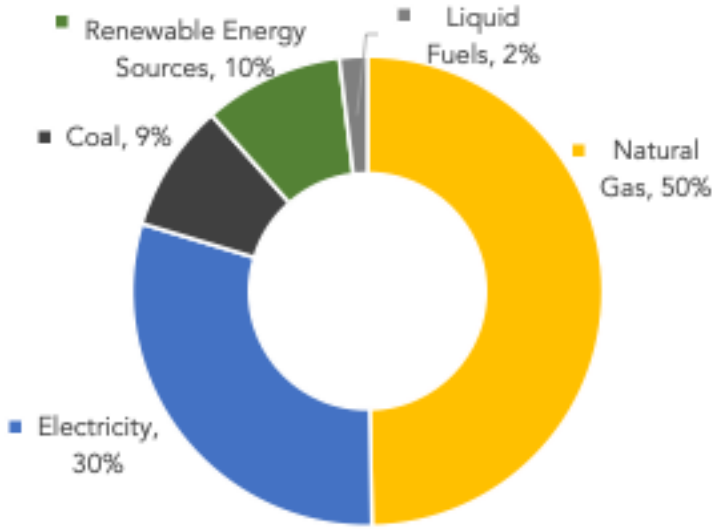
[46] Data source: MoEUCC, 2021.

Figure 18 - Number of buildings by building type in 2000[47]



In 2022, energy consumption in buildings was met by natural gas (50%), electricity (30%), coal (9%), renewable energy sources (10%) including solar, geothermal, wood and plant/animal residues, and liquid fuels (2%) (See Figure 19).

Figure 19 - Energy consumption in buildings by energy resource (2022)[48]



Building sector is responsible for 12% of total GHG emissions in 2022. Energy consumption of buildings has been increasing by 4% per year since 1990. Although energy efficiency activities lower the rate of increase in energy consumption of buildings, growing building stocks is expected, with a continued increase in GHG emissions in Türkiye. GHG intensity of the buildings decreased 34% between 1990 and 2022.

[47] Data source: 7th NC, 2019.
[48] Data source: MENR, 2024.

Türkiye's building stock is expected to continue increasing until the projected year 2050, with the total building area anticipated to exceed 5.5 billion m².

2.8 MANUFACTURING INDUSTRIES AND CONSTRUCTION

Turkish industry is composed of many different sub-sectors with different characteristics that represent approx. 20% to 30% in GDP. Among the sectors of industry, manufacturing industry greatly affects national economic growth. Turkish manufacturing industry[49] had 4.7 million jobs with a turnover of 5,118 billion TRL in 2021. Its share in the GDP was 22.2. The food, basic metal, manufacture of motor vehicles, trailers and semi-trailers, and textile industry represent the largest contributors to manufacturing industry turnover with an 15.6%, 9.7%, 8.7% 8.4% share respectively. Those sectors are followed by fabricated metal products except machinery and equipment, wearing apparel, manufacture of the Non-metallic mineral products, rubber and plastic products, and electrical equipment.[50] The automotive industry has the highest share of Turkish exports, representing 10.5% of exports.[51]

Table 5 - Main indicators of industry sector, 2021[52]

Sub-sector	number of enterprises	number of persons employed	Turnover (Billion TRY)	Contribution to GDP	
				(Billion TRY)	%
C- Manufacturing industry	444,030	4,711,078	5,115.6	1,613,6	22.2

The construction sector was one of the most important drivers of the Turkish economy, contributing 4.8% of gross domestic product (GDP) in 2022.[53]

Primary energy consumption of industry in 2020 was 36.26 Mtoe, responsible for 32% of the total energy consumption.[54] The largest two single industries, in terms of primary energy consumption, have been the non-metallic mineral industry with 26% (9.26 Mtoe) and the iron and steel industry with 24% (8.55 Mtoe).[55]

[49] Activities classified under C at the Statistical Classification of Economic Activities in the Europe an Community (NACE) Rev. 2.
[50] Data source: TurkStat, 2024_c.
[51] Data source: TurkStat, 2024_b.
[52] Data sources: 7th NC, 2019 and TurkStat, 2024_b.
[53] Data source: TurkStat, 2022_a.
[54] Data source: MENR, 2022.
[55] Data source: MENR 2022.

Although energy consumption of the industrial sector increased from 13.6 Mtoe to 36.3 Mtoe during the 1990-2020 period, emission intensity of the sector decreased considerably from 2.4 ton CO2eq./toe to 1.8 "ton CO2eq./toe in the same period. Energy efficiency activities, increasing share of renewables and using waste as an alternative fuel is expected to lead to lower the rate of increase in GHG emissions from the industrial sector.

2.9 TRANSPORTATION

Türkiye's transportation sector has shown rapid development in recent years. Road and railway networks have expanded, and new airports and seaports have been opened. Tunnels and bridges have been built, which will contribute to the reduction of the sector's emissions from road transportation. Between 2002 and 2023, the number of tunnels increased by 496%, and bridges and viaducts increased by 65% in 21 years. The total railway network grew by 27%. (See Table 6)

Table 6 –Selected Key Indicators for Transportation Sector[56]

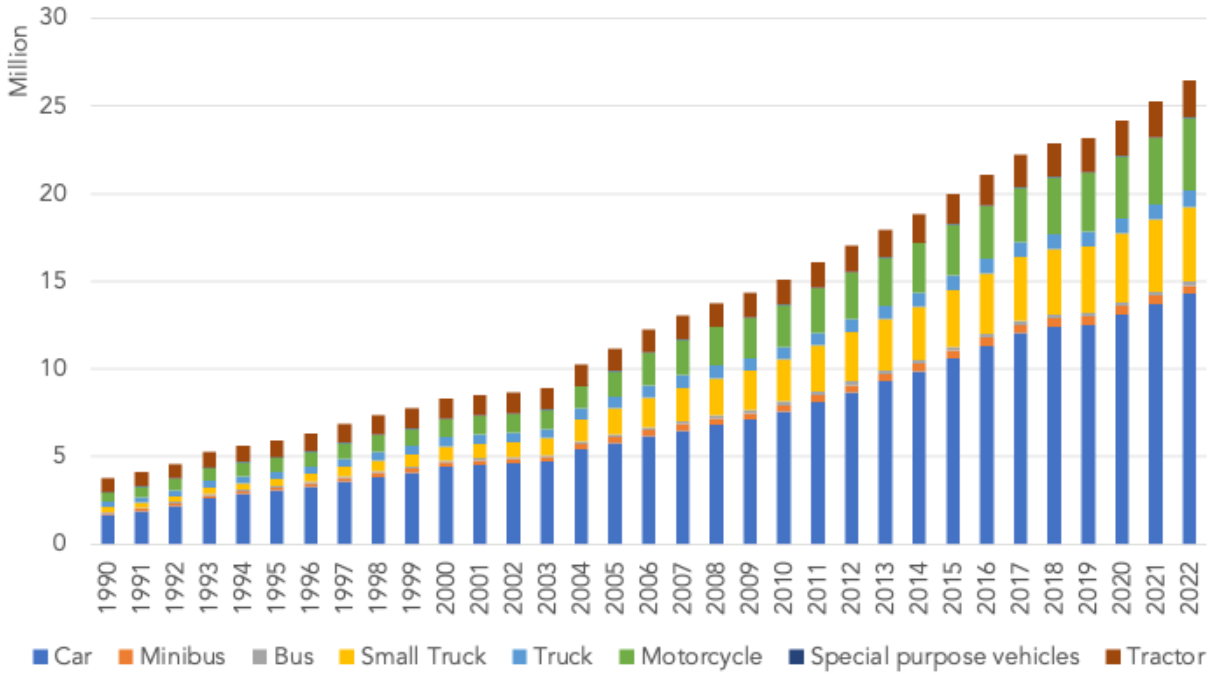
Indicator	2002	2023	Change
Highway (km)	1,714	3,726	117%
Road Tunnel Number - (Km)	83	495	496%
Number of Road Bridges and Viaducts - (Km)	5,967	9,871	65%
Railway Network (km)	10,948	13,919	27%
Electric Railway Line Length (km)	2,082	7,142	243%
High Speed Train Line Length (km)	0	2,251	-
Number of Active Airports	26	58	119%
Port Facility	149	217	46%

The transport sector was responsible for transportation for 26% (30.74 Mtoe) of Türkiye's final energy consumption in 2022. Road transport was responsible for 93.5% of energy consumption in the transportation sector and air transport was responsible for 3.66%. The number of road motor vehicles have been increasing since 1990. While there were 3.8 million road motor vehicles in 1990, this number reached approximately 26.5 million in 2020 (See Figure 20). This was reflected in the rise of road motor vehicles per 1000 people from 68 in 1990 to 290 in 2022. In

[56] MoTI, 2022.

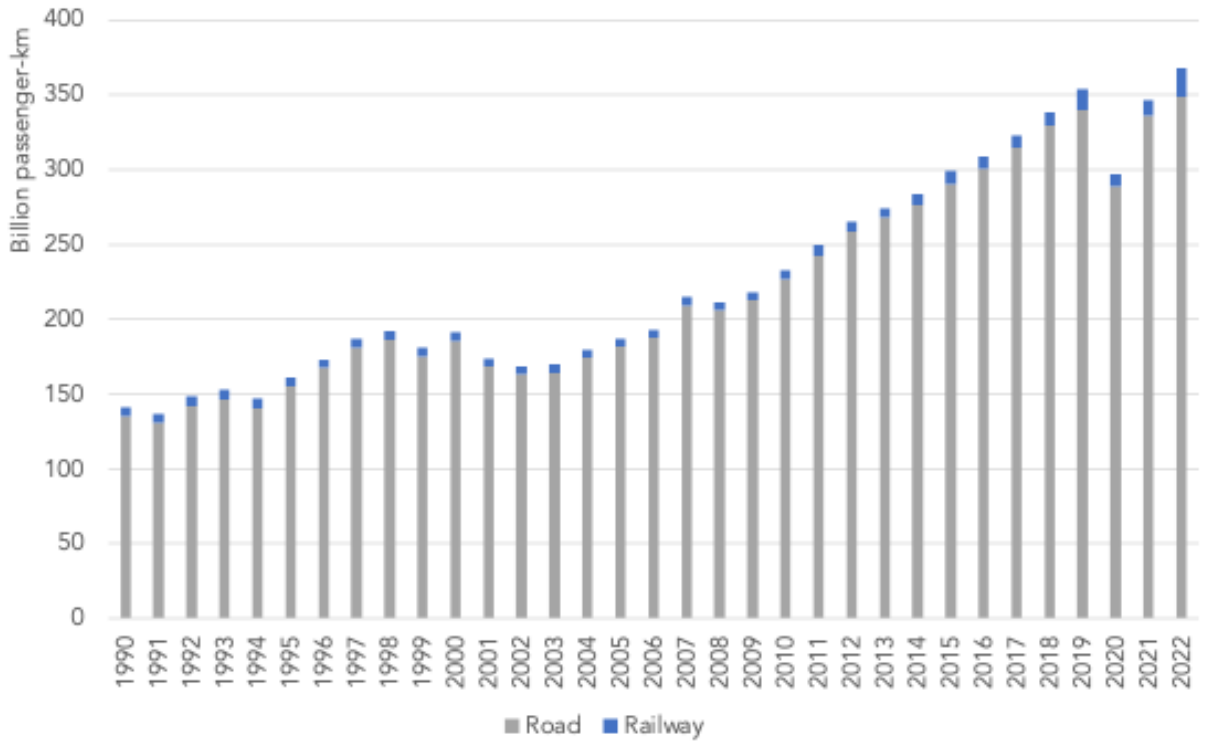
parallel, the total movement of passengers (passenger-km) using inland transport increased 160% between 1990 to 2022 with (See Figure 21).

Figure 20 - Road motor vehicles, 1990-2022[57]



[57] Data source: TurkStat, 2023_f.

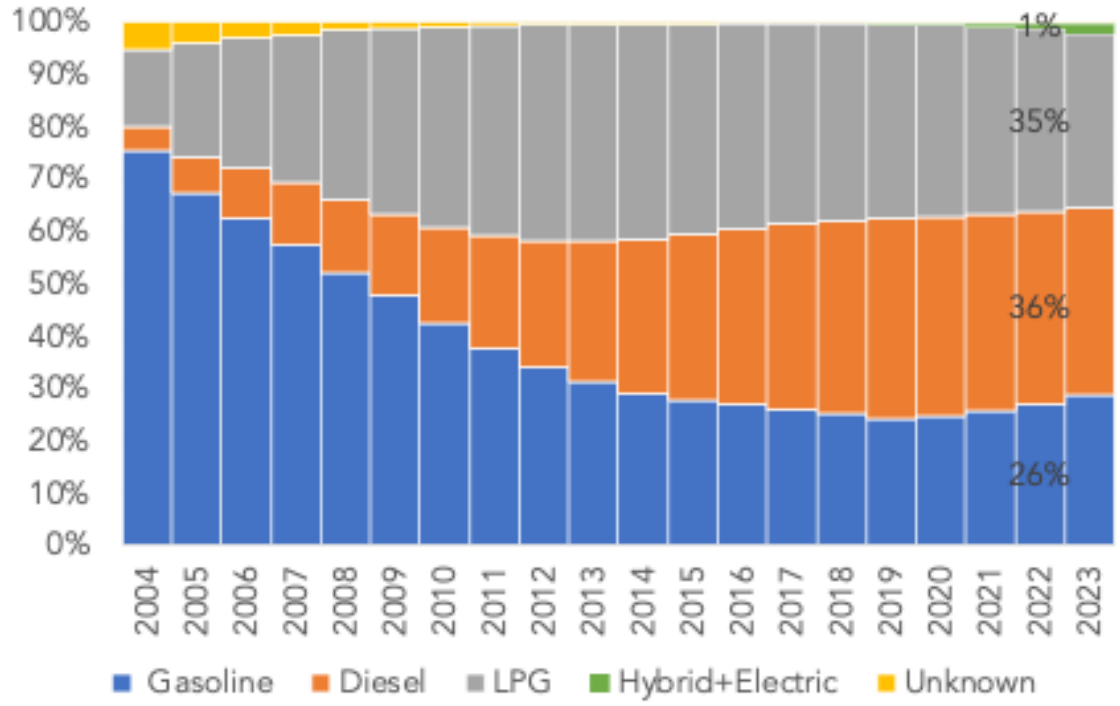
Figure 21 – Change in passenger transport in Türkiye (1990-2022)[58]



As a result of recent motor vehicle technology and an increase in alternative fuel use after 2003, the transport efficiency has increased. LPG was introduced in road transportation after 1997 and fuel used shifted from gasoline to diesel and LPG in road transportation. The share of gasoline fueled automobiles of road transport decreased from 67% in 1990 to 26.5% in 2022. The share of LPG was 34.7% in 2022 which was much higher than gasoline's share for the same year. (See Figure 22) Since the carbon intensity of LPG is the lowest among other liquid fuels, a decrease in GHG emissions from road transportation was seen.

[58] Data source: OECD, 2024.

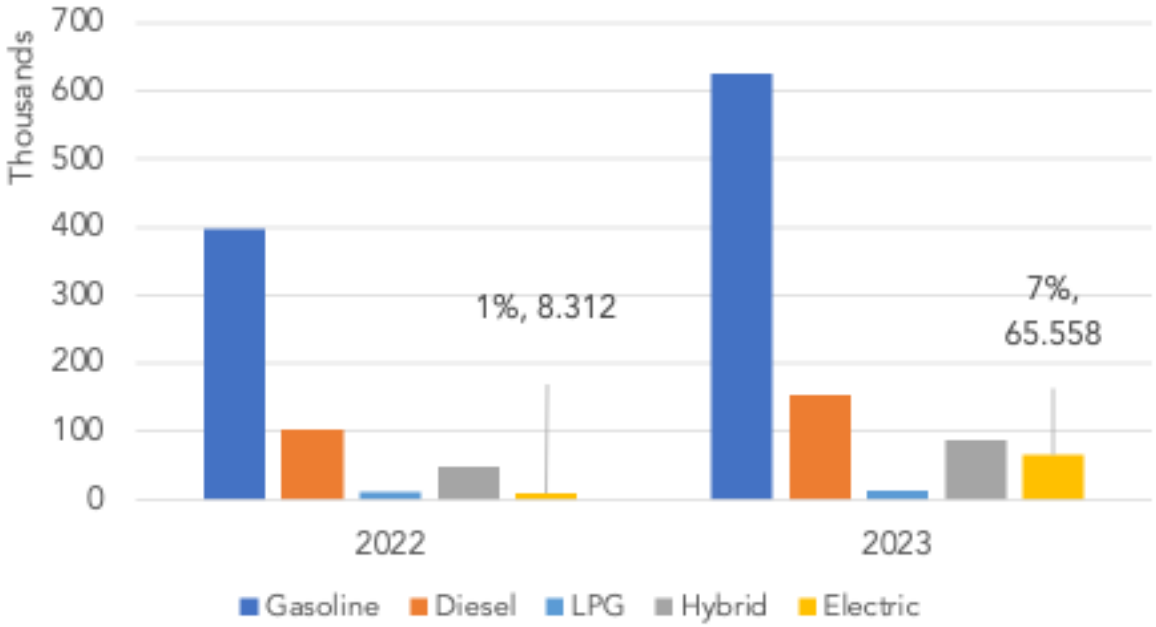
Figure 22 - Distribution of cars registered to the traffic according to fuel type, 2004 - 2023[59]



Electric and hybrid car sales showed significant growth between 2022 and 2023, largely as a result of Türkiye's policies aimed at promoting cleaner transportation alternatives. In 2022, electric vehicles accounted for 1% of the market, with 8,312 units sold. However, by 2023, the market share of electric vehicles surged to 7%, with 65,558 units sold, demonstrating a rapid shift towards electrification. Hybrid vehicle sales also increased significantly, from 48,079 units in 2022 to 87,933 units in 2023. This notable rise in electric and hybrid vehicle adoption reflects both consumer preferences and the impact of Türkiye's policies that support the transition to greener energy in the automotive sector.

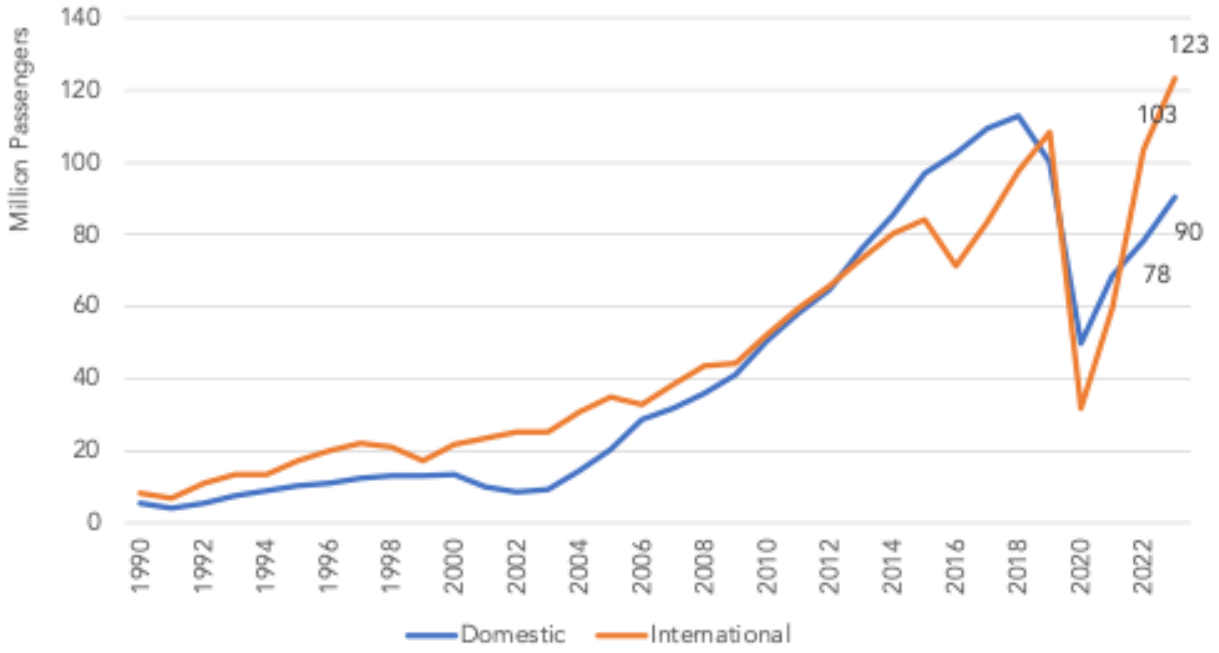
[59] Data source: TurkStat, 2023_f.

Figure 23 – Annual Automobile Sales By Fuel Type (2022-2023)



Besides road and railway transport, airline sector also rapidly expended. Number of domestic and international passengers using airways fourteenfold in the last 30 years, from 13,6 million in 1990 to 181,8 million in 2022. Türkiye's plane inventory increased from 138 to 668 and number of airports increased from 26 to 58 from 2002 to 2022.

Figure 24 - Total domestic and international travel passengers at the airports[60]



2.10 WASTE

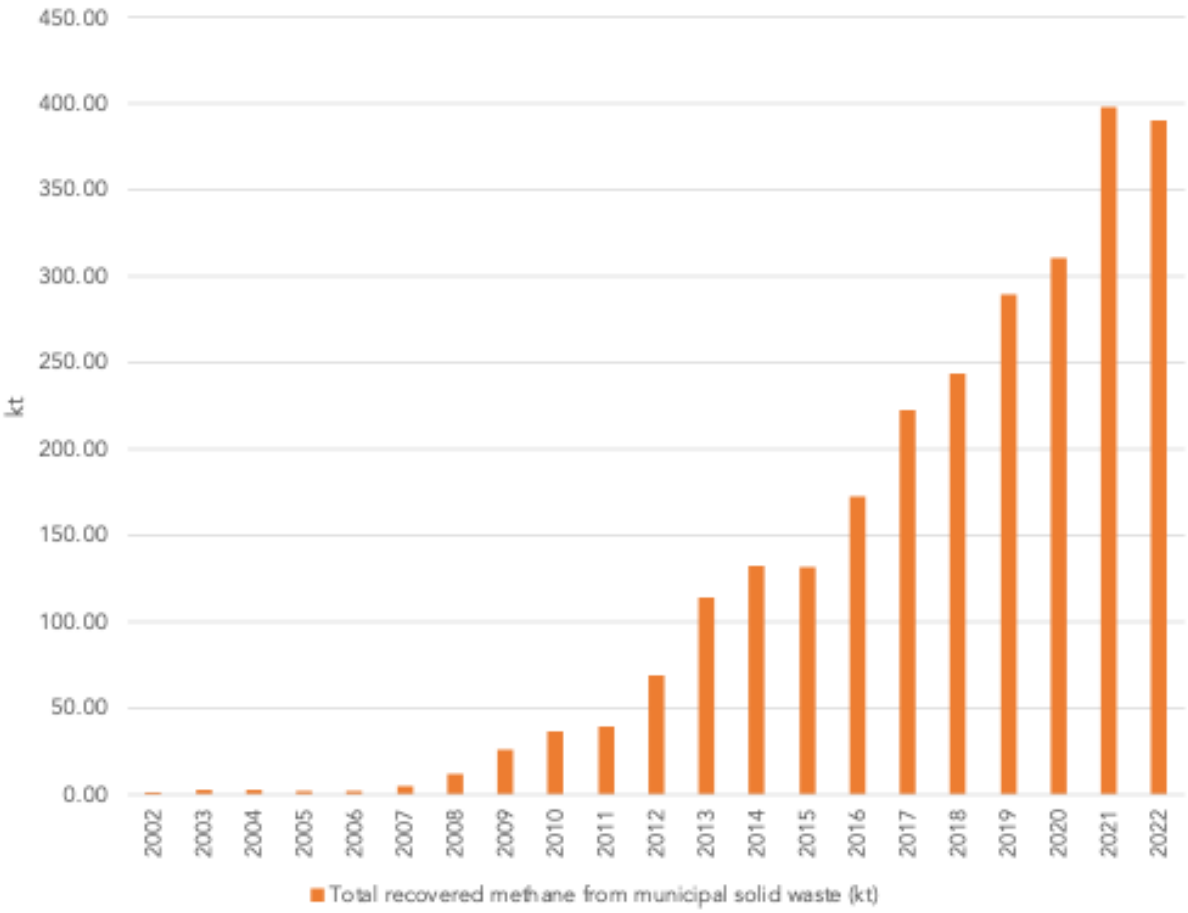
Greenhouse gas emissions originating from the waste sector in Türkiye are predominantly related to solid waste disposal and wastewater treatment. Waste generation has been growing continuously in Türkiye; for instance, according to Turkstat data, annual municipal solid waste generation increased from 21.96 million tons in 1990 to 30.3 million tons in 2022. In the meantime, significant improvement was achieved in waste management. In 1994, by far the main disposal method for municipal waste was the open dumping of waste, nearly without the existence of any composting of waste or other biological waste recovery methods and only 2 landfills were available. With the developments in the sector, 94 landfills were in operation by 2024, with these facilities, 94.5% of the municipal population is served with waste management services[61]. The recovery of methane from waste disposal sites and wastewater treatment plants increased significantly from the year 2002 onwards resulting in reduction of GHG emissions from the waste sector. Number of landfill sites with landfill gas recovery increased from 1 in 2002 to 82 in 2024. Moreover, Türkiye also has methane recovery at one of its unmanaged solid waste sites, where 1.2 kt methane was recovered, which

[60] Data source: TurkStat, 2023_g.

[61] MoEUCC, 2023_a.

increased the total to 390 kt in 2022[62] In 2022, 2,5% of the total primary energy consumption was covered from waste to energy applications.

Figure 25 – Recovered methane at the solid waste disposal sites (2002-2022)



Biological treatment of waste is also on the verge of development. According to National Waste Management Strategy and Plan, biowaste rate is 50,41% in the municipal waste. Biological treatment of waste is also in developing trend; however annual capacity is currently not satisfactory at a too low level of 1.5 Mt. There exist 34 biological waste recovery facilities (14 composting, 18 bio-methanation, 2 biodrying facilities) for municipal waste; 33 mechanical treatment facilities for mixed municipal waste and 3 incineration plants for municipal waste. Private sector has been involved in solid waste management investments supported by incentives such as the YEKDEM mechanism. The private sector generally focuses on the rehabilitation of dump sites in the form of long-term (up to 49 years) build-operate-transfer (BOT) contracts with the Municipalities. These

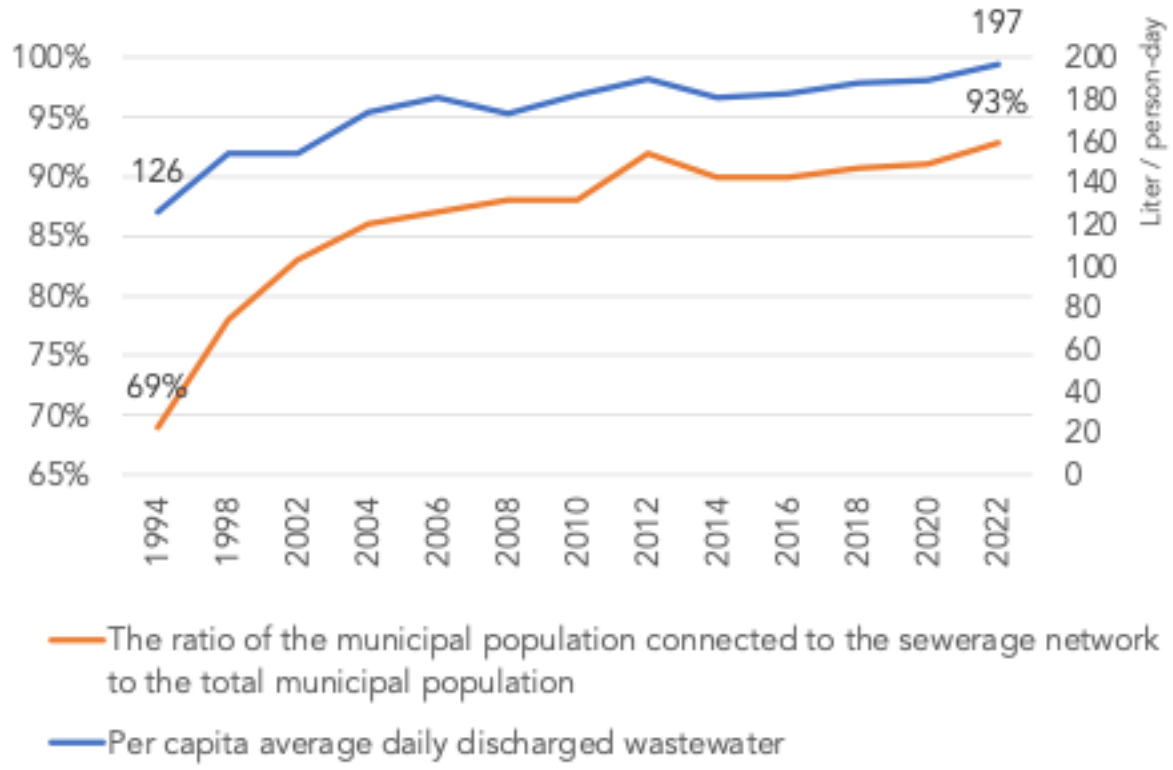
[62] NIR, 2022 p. 412.

public-private partnership (PPP) projects are popular on integrated waste management for a city or a region including landfill gas capturing, biological recovery, and waste to energy facilities (see Section 3.2.5)

Türkiye is in the process of transition to a circular economy. Within this process, Türkiye's priority is to continue our work on the basis of the Zero Waste project that the Country started in 2017.

Between 1994 and 2022, both the ratio of the population connected to the municipal sewerage network and their per capita wastewater discharge increased. The percentage of the municipal population connected to sewerage rose from 69% to 92.8%. Per capita average daily wastewater discharged by the municipal population increased from 126 liters in 1994 to 197 liters in 2022.

Figure 26 – Wastewater amount and services[63]

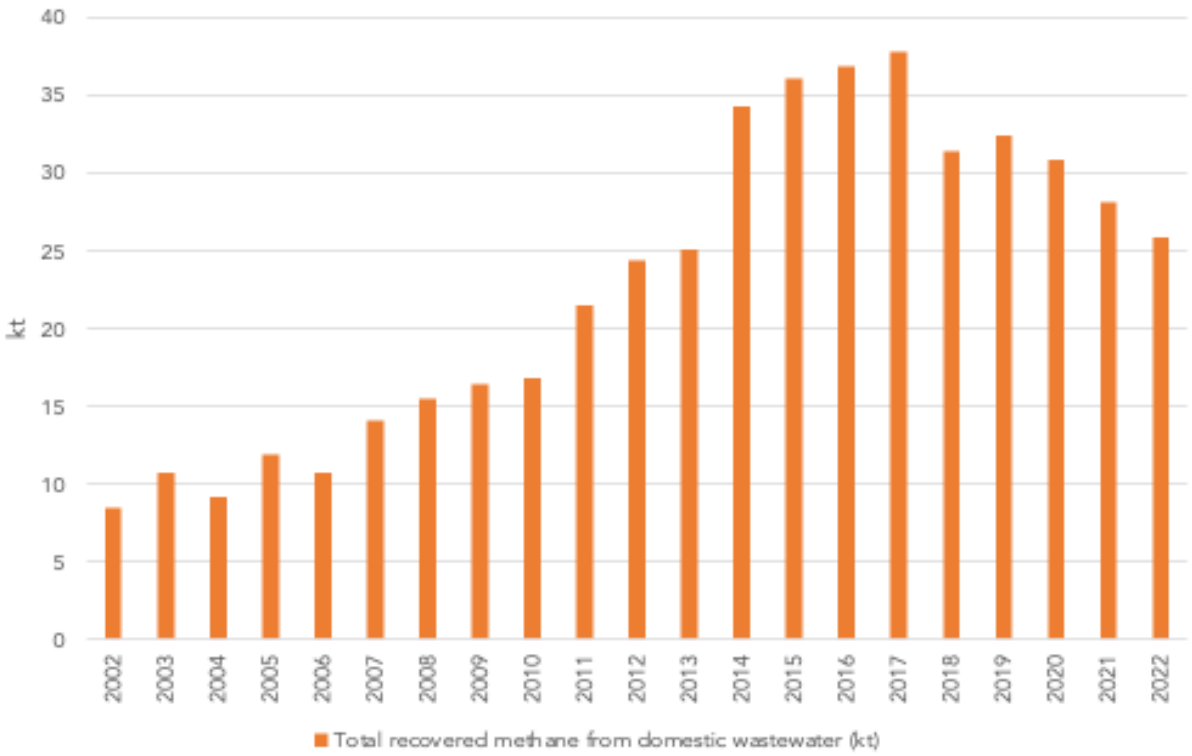


Within this period, the reuse ratio of treated wastewater has also increased and in the first half of 2024, it reached 5.5%. The aim is to increase Türkiye's wastewater recovery ratio to 15% until 2030 for different purposes such as agricultural irrigation, urban and recreational use, environmental/ecological use, industrial purposes,

[63] MoEUCC, 2023_b.

etc. Also, 100% of the municipal population is projected to be served with wastewater treatment plants by the year 2028. While increasing the treated wastewater, Türkiye also increased its capacities to utilize wastewater. Between 2002 to 2022, number of wastewater biogas facilities with methane recovery increased from 2 to 21 and the amount of methane recovery increased from 8.5 kt to 25.9 kt during same period.[64]

Figure 27 – Recovered methane at the wastewater treatment facilities (2002-2022)[65]



The circular economy and wastewater biorefinery approach, that is based on resource efficiency and environmental sustainability by recycling and minimizing the use of raw materials, has also been adopted in Turkey's wastewater management. Reuse of treated wastewater within the framework of circular economy principles is encouraged.

GHG emissions from waste disposal sites increased by 83.4% during 1990-2022 periods (from 5.8 Mt to 10.6 Mt), while waste disposal was increased by 61% in the same period. Türkiye's population increased by 54.2% while GHG emissions from wastewater discharge increased by 28%. The sector's most important greenhouse

[64] NIR, 2022 p. 443.
[65] NIR, 2022.

gasses are methane (CH_4) and nitrous oxide (N_2O) and the waste sector alone is responsible for 19.6% of total CH_4 emissions and 6.2% of total N_2O emissions in the year 2022.[66] Thus, methane recovery supports the decrease of waste sector's emissions.

2.11 AGRICULTURE

The agriculture sector is among the sectors which provide a major contribution to the country's GDP, exports, and rural development. Türkiye is an important producer and exporter of agricultural commodities on world markets and is estimated to be the world's 7th largest agricultural producer.[67] Türkiye's agricultural vision for the year 2023 is that being a country which provides its population with sufficient, best quality and safe food; improves its net exporter position in agricultural products and; increases its competitiveness in the global market aiming to be among the top five overall producers globally. Türkiye's vision for its centenary in 2023 includes other ambitious goals; i) agricultural GDP reaching to 150 billion dollars; ii) agricultural exports over 40 billion dollars; iii) sustainable agricultural growth iv) achievement and land consolidation on 14 million ha; and v) modern irrigation systems for all irrigable land.[68]

Türkiye's agricultural sector accounted for 6.46% of the country's GDP in the year 2022. The main sources of agriculture sector GHG emissions are enteric fermentations, agricultural soils and manure management. Agricultural activities were the primary contributors of CH4 and N2O, 60.96% of CH4 emissions and 80.29% of N2O emissions originate from agricultural activities in 2020.[69]

[66] Data source: NID, 2024.
[67] OECD, 2016.
[68] MoAF, 2017.
[69] Data source: NIR, 2022.

Figure 28 - Agriculture Basins of Türkiye[70]

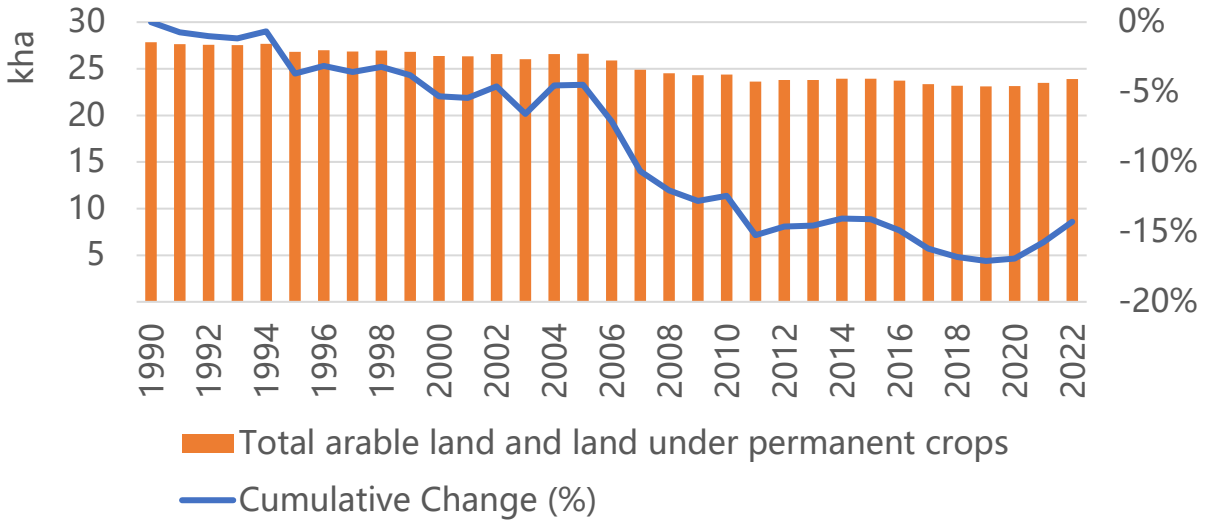
Türkiye identified 30 agriculture basins defined by climate, soil characteristics, topography, and land class criteria in 2009 (See Figure 28). Basin-based agricultural support policy was implemented for 17 products. In order for more rational planning, district level agricultural basins were then defined in 2016 and the number of agricultural basins reached to 941 basins. 21 products have been under the scope of basin-based supporting systems. By adding newly established restricts, the number of basins increased to 944 in 2018.

2.11.1 Agricultural Lands

There has been a significant decline of agricultural lands in Türkiye since 1990. Türkiye had 23.9 million hectares arable land in 2022 while it was 27.9 million hectares in 1990 (Figure 29). There are 921 different agricultural basins based on rainfall, temperature, and topographical properties. In those agricultural basins above 250 agricultural products are produced and sold. For 2022, of the total arable land, 69% is cropland, 12% is fallow land and the rest of them are cultivated as horticulture, vegetable, vineyards and olive gardens.

[70] MoAF, 2023_b.

Figure 29 - Total arable land and land under permanent crops (1990-2022)[71]



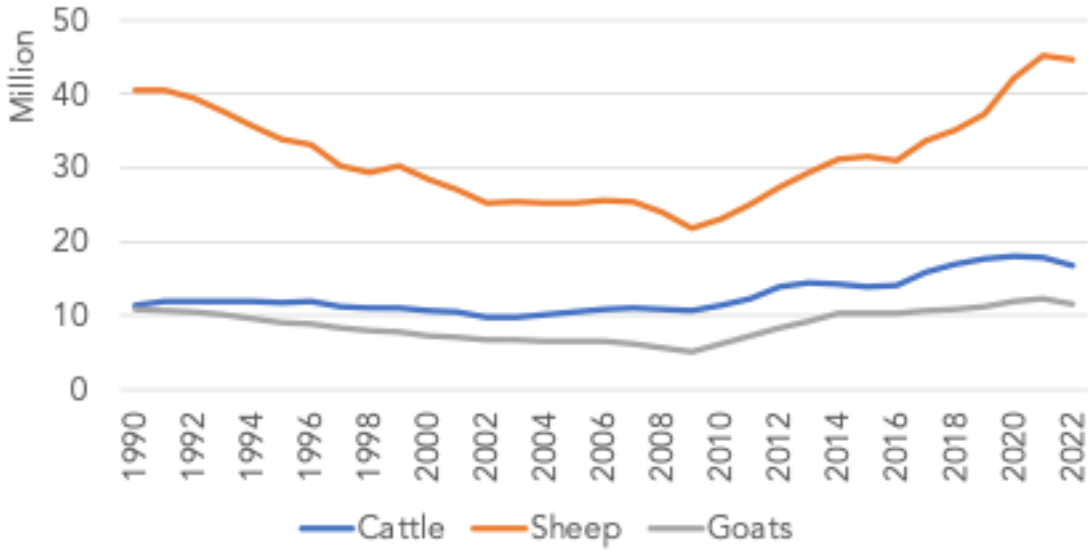
The decrease in agricultural lands in Türkiye is primarily driven by urbanization and industrial expansion. Since the 1980s, Türkiye's share of the population living in the cities has increased dramatically. Cities expanded into areas that were previously dedicated to agriculture, reducing the amount of land available for farming. Additionally, as the cities grow, industrial facilities are also increasingly constructed on these lands, further contributing to the reduction in agricultural space.

2.11.2 Livestock

Livestock has the biggest share of the agricultural GHG emissions and is an important part of Türkiye's agricultural sector. In 2022 the total number of cattle was approximately 16.9 million, and for sheep and goats, it was around 44.7 and 11.6 million, respectively while those numbers were 11.4 million, 40.6 million and 11 million respectively in 1990. Türkiye has experienced a decline in the number of sheep and goats since 1990. Based on recent agricultural policy to increase livestock for sustainable food supply from domestic sources, GHG emissions are expected to increase from enteric fermentation and manure management.

[71] TurkStat, 2023_d.

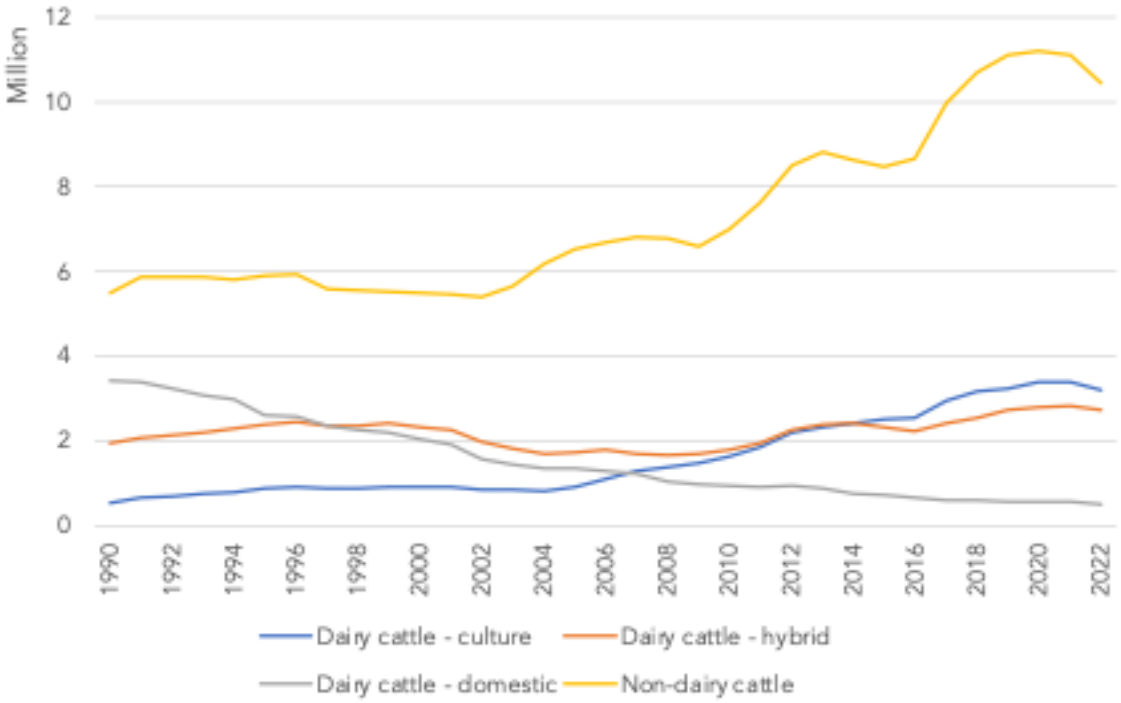
Figure 30 - Livestock population, 1990-2022[72]



In Türkiye there are three dairy cattle types categorized as culture cattle, hybrid cattle and domestic cattle. Culture dairy cattle is a dairy cattle type having higher milk yields compared to domestic dairy cattle whereas milk yields values of hybrid cattle are between them. Hybrid cattle are breeds of culture and domestic dairy cattle. As it is seen in the table, culture dairy cattle population is increasing by years except for the years 1997, 1998 and 2002-2004. But, in general, the culture dairy cattle population has a positive trend in the period 1990-2022, which has a percentage increase of 41% from 9% in 1990 to 51% in 2022 within dairy cattle population. For hybrid cattle population, which was around 2.7 million in 2022 despite being 1.9 million in 1990, a big increase or decrease cannot be observed throughout the same period. The share of domestic cattle among dairy cattle was 58.1% in 1990 but this ratio reduced to 8.0% in 2022. As seen in Figure 31, non-dairy cattle number increased by approximately 5.0 million from around 5.5 million in 1990 to more than 10.5 million in 2022 and its share in total number of cattle increased from 48.2% to 62.2% between 1990 and 2022. However, the final three reporting years identified a total decrease of around 0.7 million in the population of non-diary cattle.

[72] NID, 2024.

Figure 31 - Population numbers for cattle categories, 1990–2022[73]

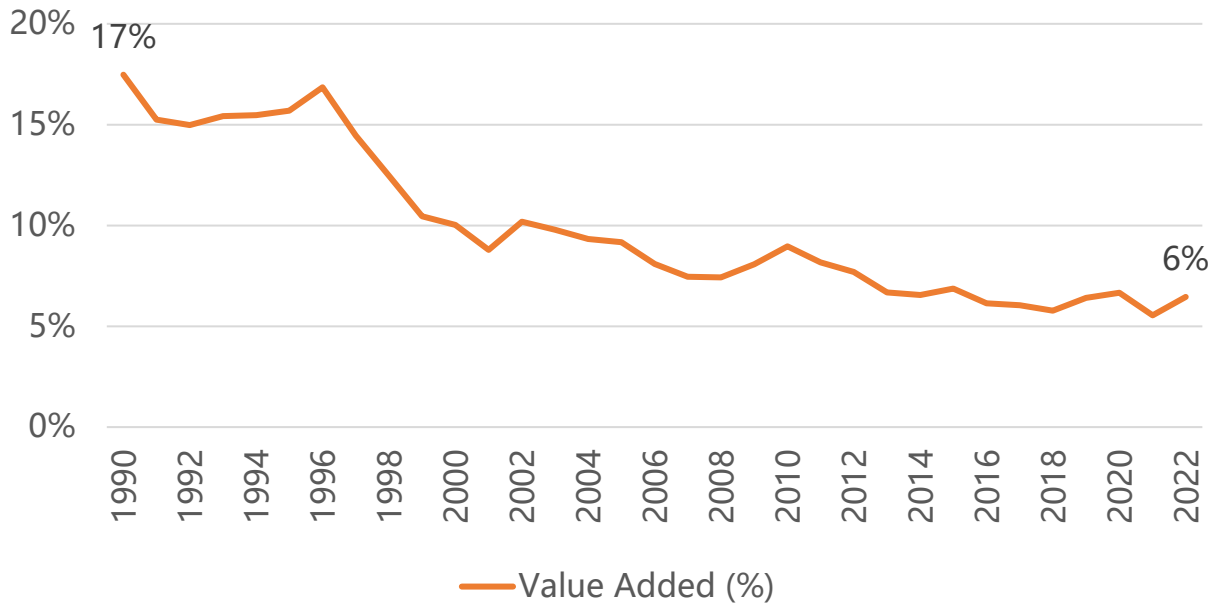


2.11.3 Value Added

The share of the agriculture sector in GDP in 1960 was 54% in Türkiye and Türkiye was considered to be an agricultural country in those years. However, the contribution of the agricultural sector to the economy gradually decreased and the share in GDP fell below 30% by the end of 1970, below 20% in the mid-1980s and below 10% by the 2000s. By the year 2022 the share of agriculture in GDP was dropped to 6.46% (See Figure 32), and the course of the ratio is expected to continue declining in the coming years.

[73] NID, 2024.

Figure 32 - Value added of Agriculture sector as % of GDP, 1960-2022[74]



2.11.4 Organic Agriculture

Organic agriculture in Türkiye began practice in the mid-1980s. In order to create an improvement in the legal framework for organic farming, the By-Law on Production of Plant and Animal Products through Ecological Methods entered into force by 1994. The Organic Agriculture Act No. 5262 was prepared within the framework of the EU laws and was enacted in 2004. On the basis of this law, the By-Law on the Principles and Implementation of Organic Agriculture was passed in 2010. By 2002, 310,125 tonnes of organic products were produced on an agricultural area of 89 827 ha, those figures were 342,548 ha agricultural land under organic farming with a crop production of 1,635 million tonnes in 2023.

2.11.5 Agricultural Soils

Agricultural soils was one of the main drivers of the agricultural sector's GHG emissions. In Türkiye around 19.6 million hectares of agricultural land is fertilized annually, 113 kg of fertilizers per hectare is used on the average. Total N-fertilizer consumption increased from 1.2 Mt N to 1.9 Mt N during 1990-2016.[75] In 2022, input

[74] Data source: World bank, 2024

[75] 7th NC, 2019

from N fertilizers applied to cropland and grassland at the agricultural soils increased to 1.6 Mt N for inorganic fertilisers and 0.9 Mt N for organic fertilizers.

2.12 FORESTRY

Türkiye is broadly located in the Mediterranean climate zone. Türkiye is considered as one of the richest countries in terms of biodiversity which is the result of different topography and different climate zones. A great part of this biodiversity is located in the forest lands. In North Anatolia and parts of the Marmara region, forest ecosystems are composed of pure and mixed forests, which include coniferous tree species such as black pine, Scots pine, fir, spruce and juniper, as well as broad-leaved tree species such as beech, oak, hornbeam, alder, chestnut, ash, elm, poplar, maple, hazelnut and rhododendron. In the South, West and large parts of Marmara, the forests are pure and mixed Mediterranean forest ecosystems composed of coniferous tree species, such as red pine, black pine, Taurus fir, Taurus cedar, juniper, stone pine, Aleppo pine, maritime pine and cypress, as well as broad-leaved tree species such as sweet gum, oak, eucalyptus along with maqui's elements such as sandal and laurel. Along with the steppes, Türkiye has arid and semi-arid forest ecosystems consisting especially of pine, Scots pine, cedar, juniper and oak species. Türkiye also has forest ecosystems that are within the transition zone between coastal and inland regions in Central, Eastern and South-eastern Anatolia regions.

A large portion of Türkiye's forests are natural forests with high biodiversity values. Many of the plant species have additional values in raw material production, including wood, and the use of roots, bark and resin for medicinal and aromatic purposes. Many of the harvested fauna species are used for the production of herbal products of animal origin.[76]

According to forest inventory results, forest area was 20.2 Mha in 1973 and increased to 22.93 Mha in 2020. Forest lands increased nearly 2.3 M hectares in the last 46 years. According to 2020 forest inventory results, approximately 9.7 Mha of this forest estate can be classified as degraded forests. The inventory estimates that growing stocks increased from 1.1 billion m3 to 1.7 billion m3 during 1973-2020 periods. The annual increment of the forests in Türkiye changed to 28.1 million m3, which is 1.4 m3 in 1 ha in 1973, to 47.0 million m3 which 2.1 m3 in 1 ha in 2020. The

[76] 7th NC, 2019

main reason for this increment is the increase of growing stock due to the silvicultural tending activities species.[77]

Pinus brutia, Pinus nigra and Pinus sylvestris are the dominant coniferous species among the other coniferous such as four kinds of Abies spp., Picea orientalis, Cedrus libani etc. In proportion these three-pine species is more than 52 % as in total volume of growing stock. Fagus orientalis and 22 Quercus spp. have a 68% ratio in total volume of the deciduous trees such as Tilia, Ulmus, Alnus, Castanea species.[78]

99% of the forests in Türkiye belong to the state. 3.64 million hectares of the total forest area (15%) are found in protected areas and the rest of the 19.3 million hectares of forest area are in managed forests.

Table 7 - Forest inventory results of Türkiye, Area 2020.[79]

Forest Type	Total (ha)	Coniferous (ha)	Deciduous (ha)	Coniferous+ deciduous Mixed (ha)
Total	**22 933 000**	**10 969 246**	**7 405 972**	**4 557 782**
Productive	13 264 429	7 311 005	3 878 112	2 075 312
Degraded	9 668 571	3 658 241	3 527 860	2 482 470

Table 8 - Forest inventory results of Türkiye, Growing Stock, 2020.[80]

Forest Type	Total (ha)	Coniferous (ha)	Deciduous (ha)
Total	**1697 055 000**	**1156 449 376**	**540 605 624**
Productive	**1628 295 394**	1114 195 394	514 100 000
Degraded	**68 759 606**	42 253 982	26 505 624

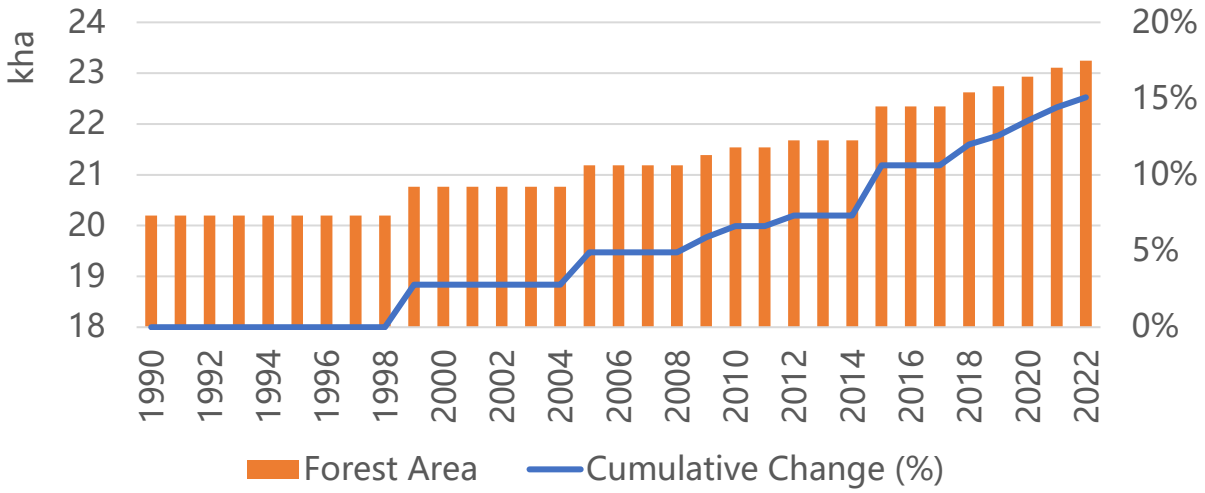
Table 9 - Forest inventory results of Türkiye, Annual Increment, 2020.[81]

Forest Type	Total (ha)	Coniferous (ha)	Deciduous (ha)
Total	**47 400 000**	**31 585 762**	**15 814 238**
Productive	**45 410 077**	**30 602 836**	**14 807 241**

[77] 7th NC, 2019
[78] 7th NC, 2019
[79] Data source: MoAF, 2023_a.
[80] Data source: MoAF, 2023_a.
[81] Data source: MoAF, 2023_a.

Degraded	**1 989 923**	**982 926**	**1 006 997**

Figure 33 – Change in forest areas of Türkiye (1990-2022)[82]



2.12.1 Forest Restoration

Almost half of Türkiye's forests are considered to be degraded, with less than 10% canopy cover. In addition, 13.3 million hectares of forest has a canopy cover more than 11%. The ability of forests to regenerate declines based on human-induced pressures, including industrialization and urbanization. However, in areas where threats have been reduced, forests have regenerated. The General Directorate of Forestry has been conducting activities on the restoration of degraded forests and reforestation since 1995. The main goal of these efforts is to develop forest structure through the sink capacity and increase the yield ratio of forests. This process also covers the maintenance of naturally regenerating forest species. Reforestation and rehabilitation have been carried out in Türkiye. In 2020 9,320 ha was reforested and 56,576 ha was rehabilitated.[83]

[82] TurkStat, 2023_d.

[83] Data source: MoAF, 2023_a.

Figure 34 - Reforestation Activities, 1992-2020.[84]

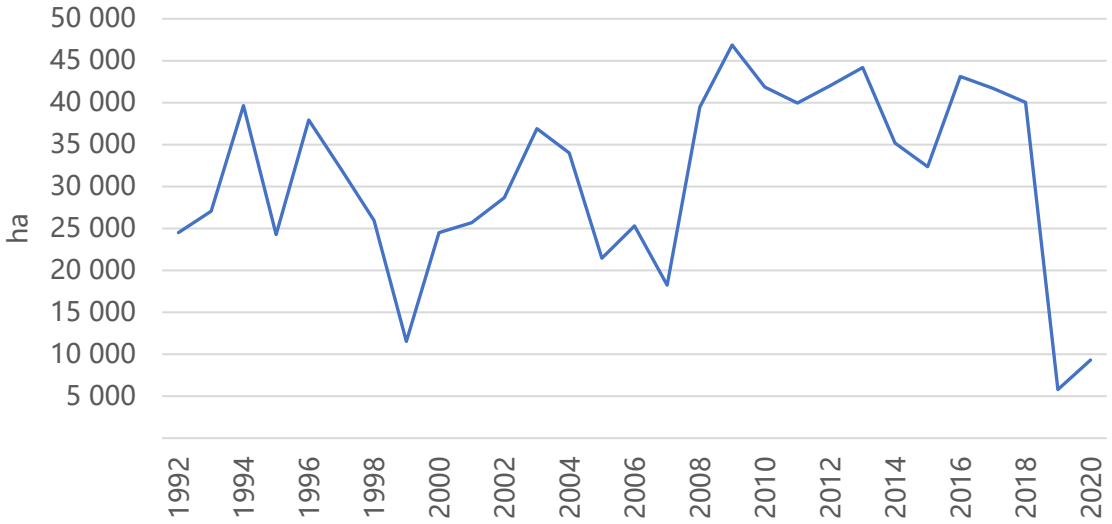
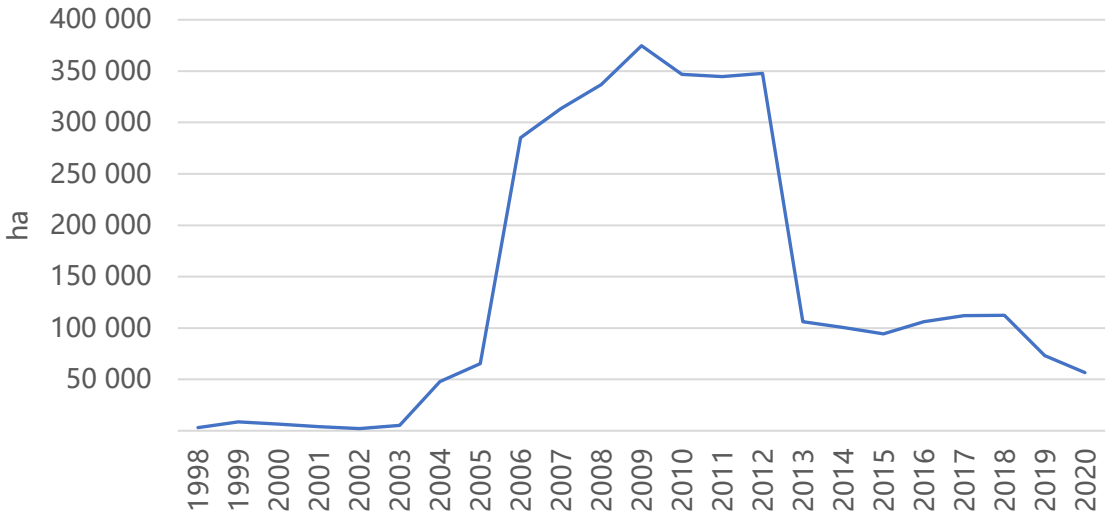


Figure 35 - Forest Rehabilitation Activities, 1998-2020.[85]



Sustainable forest management activities aim to increase forest area and growing stocks in Türkiye through reforestation, rehabilitation and Carbon removal rate is expected to increase in the next decade. GDF has a target for increase the growing stocks per hectare and forest area in the Strategic Plan of GDF (2019-2023).

[84] Data source: MoAF, 2023_a.

[85] Data source: MoAF, 2023_a.

2.13 TOURISM

Surrounded by seas on three sides, acting as a natural bridge between Asia and Europe, and with unique geopolitical importance, Türkiye has been a cradle of great civilizations throughout history. There are nine World Heritage Sites in Türkiye and an additional 19 temporarily listed values on the World Heritage List. With its 8,333 km long coastline, Türkiye is a major tourist attraction. Tourism is also the country's main source of foreign exchange.

Türkiye is the 4th most popular tourist destination in the world, attracted approximately 57 million tourists in 2023. Türkiye had 567 blue-flag beaches in 2024. There are also 27 blue-flag marinas in Türkiye.[86] Bed capacity documented by the Ministry of Culture and Tourism and municipalities was 0.9 million in 2000 and reached 1.96 million in 2022.[87]

There has been a rapid increase in the number of tourists coming to Türkiye (See Figure 36). The annual number of tourists has grown from approximately 5.4 million in 1990 to 51.4 million in 2022 and reached 57.1 million in 2023. It was low in 2020 and 2021 due to the COVID19 pandemic. Tourism revenue worth 49.9 billion USD was generated in 2022 and increased to 55.9 in 2023.[88]

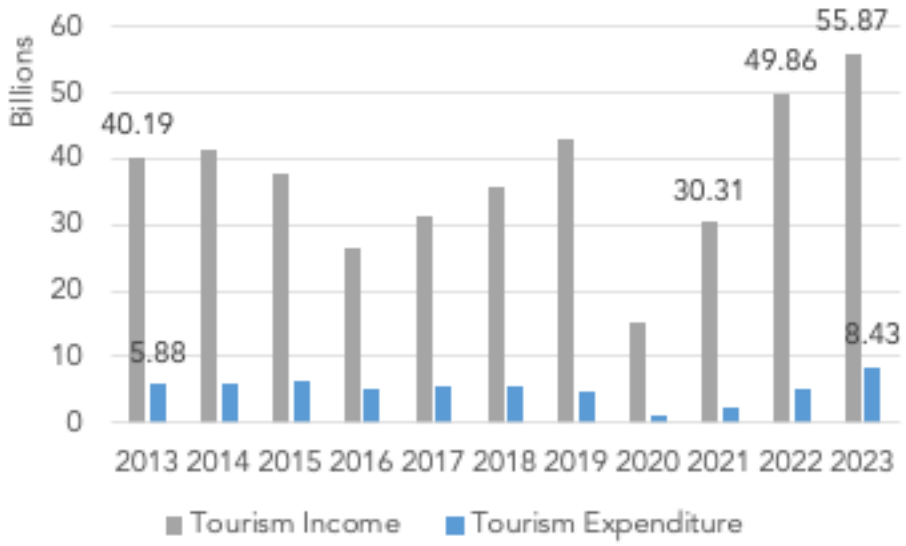
[86] TURÇEV, 2024.
[87] TURSAB, 2024.
[88] TurkStat, 2023_h.

Figure 36 - Number of tourists (1990-2023)[89]

Turkish tourism sector is targeting to be among the top 5 countries in the world in terms of attracting the highest number of tourists and receiving the highest amount of tourism revenue. In 2023, the tourism sector recorded 57.1 million tourist arrivals and generated 55.9 billion USD in tourism revenue. Meanwhile, 11 million residents from Türkiye traveled abroad, spending a total of 8.4 billion USD. This resulted in a tourism income balance of 47.4 billion USD.

[89] Data source: For 1990-2003, TURSAB, 2024 and for 2004-2022, TurkStat, 2024_h.

Figure 37 – Tourism Income and Expenditure (2013-2023)[90]



2.14 WATER RESOURCES

Türkiye has a large variety of spatial and temporal precipitation patterns. There is strong seasonality in precipitation. Approximately 40% of the total annual rainfall occurs in winter, 27% in spring, 10% in summer and 24% in autumn. The amount and type of precipitation in the winter and spring seasons are important for replenishing underground and surface water resources. The Black Sea and Mediterranean coastal areas and high mountain areas are the places in Türkiye with highest precipitation. The amount of average annual rainfall is highest in the Rize region with rainfall of about 2,300 mm. In contrast, the Central and Eastern Anatolia regions, especially in the lower plains and deep valleys and depressions of tectonic origin, have low precipitation values with the average annual amount of precipitation falling below 350-400 mm.

River hydrological regimes in Türkiye depend heavily on the variability of precipitation and these rivers regimes are thus quite irregular. According to General Directorate of State Hydraulic Works (DSİ), Türkiye has 25 hydrological basins. Türkiye has a hydro-meteorological observation network of 8,759 observation stations, of which are 260 snow monitoring stations, 1,340 flow monitoring stations, 2,812 groundwater monitoring stations and 531 lake-dam observation stations, all of which are operated by the DSİ.

[90] Data source: For 1990-2003, TURSAB, 2023 and for 2004-2022, TurkStat, 2024_h.

Türkiye's consumable surface and ground water potential is 112 billion m3 per year. Based on the projects developed by the public institutions responsible from soil and water resources in Türkiye annual water consumption for various purposes reached to 57 billion m3 as of the end of 2022

Utilization rate of the current 112 billion m3 of available water resources is still around 51%. 44 billion m3 of the available water is used for irrigation (77%), 13 billion m3 is used for domestic and industrial use (23%).

Water consumption in Türkiye is increasing due to population growth and industrialization. However, Türkiye is a country that is not rich in freshwater resources. According to the annual per capita water consumption figures, Türkiye is a country that experiences water stress. The amount of annual water available per capita is calculated as 1,313 m³ for 2022. Türkiye's hydroelectric potential was evaluated at Section 0.

2.15 CLIMATE FINANCE FRAMEWORK

Türkiye takes ambitious actions to mitigate and adapt climate change through funding climate activities including national investment projects primarily from its own resources.

Türkiye signed the Paris Agreement as a developing country, which was endorsed by various international organizations, including the United Nations (UN), World Bank, International Monetary Fund, and Organisation for Economic Cooperation and Development (OECD), and is reflected in their reports and practices. Türkiye is included on the OECD Development Assistance Committee's (DAC) list of countries eligible for Official Development Assistance and is classified by the World Bank as an upper middle-income country, granting it access to the Bank's financing. Türkiye has been a continuous beneficiary of the Global Environment Facility's (GEF) support, which is one of the main funding sources for the country's climate capacity building actions. The UN's World Economic Situation and Prospects 2024 Report[91], like previous reports, lists Türkiye among developing economies and mentions Türkiye among developing countries. Furthermore, Türkiye is included on the "developing countries" list of the Montreal Protocol on Substances that Deplete the Ozone Layer.

Türkiye, aligning with its recognition as a developing country in the international platforms, its economic-social circumstances and realities and its non-Annex II status, is not responsible for assisting other developing countries under Articles 4.3, 4.4, and 4.5 of the UN Framework Convention on Climate Change (UNFCCC) and Article 11 of the Kyoto Protocol and Article 9, 10, 11 of the Paris Agreement. This

91

has been noted in the country's earlier National Communications and Biennial Reports.

Under the Paris Agreement, developed countries have specific responsibilities to provide financial, technology development and transfer and capacity-building support to developing countries to help them mitigate and adapt to climate change. These responsibilities are clearly outlined in Article 9, 10 and 11 of the Paris Agreement. As underlined in the Updated First NDC, Türkiye anticipates the delivery and mobilization of climate finance for its endeavour toward the advancement and fair transition to a net-zero goal in accordance with Article 9 of the Agreement.

Despite being a developing country, Türkiye has no access to the Green Climate Fund (GCF), as a key financial mechanism under the UNFCCC and the Paris Agreement, and the world's largest climate fund. Türkiye's access to the GCF will not only bolster its own climate initiatives but also will reinforce the worldwide effort against this global challenge. Climate finance will also enhance Türkiye's climate ambitions and stimulate green investments from the private sector within the country.

Under the UNFCCC, a cooperation mechanisms for technology development and transfer are created to assist developing countries. However, due to its status within the UNFCCC, Türkiye is not eligible to benefit from the Climate Technology Centre and Network, the implementing body of the Technology Mechanism. The absence of access to this mechanisms that offer technical support, information exchange, and knowledge sharing has led to Türkiye struggling to harness the potential of technology development and transfer, which is vital for an effective global response to climate change.

Given its significant mitigation potential and high capacity to absorb climate finance, it is crucial to secure Türkiye's access to the financial and technological mechanisms and capacity building support under the UNFCCC and the Paris Agreement. This ensures that the country will be empowered to make significant progress towards its climate targets outlined in its NDC and various national strategies and action plans put in place over the past years.

CMB has developed "Responsible Investment Principles" (stewardship codes) for mutual funds with the Board decision dated 16.02.2024. The code entails principles for the responsible allocation, management and oversight of fund assets on a "comply or explain" basis, with the aim of creating long-term value for stakeholders as well as sustainable benefit for the economy, environment and society.

According to the regulation, management companies that decide to adapt a policy on responsible investment principles have to disclose this to public until 31.12.2024. For companies that disclose a policy, the disclosure of report on how they implement the policy should be made until 02.03.2026. CMB will also develop a standard for reporting. Regulatory work on the reporting continues."

2.16 TÜRKİYE'S SPECIAL CIRCUMSTANCES

UNFCCC established a system of annexes that divided countries into Annex I and II countries and Non-Annex countries. The Annex I countries included the industrialized countries that were members of the OECD and the former countries of the USSR as "Economies in Transition" [EIT]. Annex II included the developed and industrialized countries. Türkiye, albeit being a developing country, was included in both Annexes I and II because of its OECD membership. However, the UNFCCC does not provide a definition of "developed" or "developing" countries. Türkiye did not sign the UNFCCC when adopted in 1992 and in 1997 initiated the process to be deleted from Annexes I and II.

In 2001, at the Seventh Conference of the Parties held in Marrakesh, Decision 26/CP.7 was adopted, and Türkiye was removed from the list in Annex II. Parties were also invited to recognize the "special circumstances of Türkiye, which placed Türkiye after becoming a Party, in a situation different from that of other Parties included in Annex I to the Convention." The decision took note of FCCC/CP/1997/MISC.3, submitted by Türkiye outlining its socio-economic status as a developing country. It was explained that GNP of Türkiye was $2,700 and human-induced carbon dioxide emission was 2.3 tons per capita in 1993 and total of 153 million tons was 1/10 of the Annex II countries in the submitted document. The decision further underlined the need for all Parties to protect the climate system for present and future generations, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Türkiye's position regarding its "special circumstances" is based on the principles of equity, common but differentiated responsibilities and respective capabilities, and the right to promote sustainable development in accordance with article 3 of the Convention. Further, different from other Parties included in Annex I, Türkiye does not bear historical responsibility for climate change.

Türkiye subsequently became a Party to the UNFCCC in 2004 and submitted its First National Communication as an Annex I Party. In accordance with the Report (FCCC/IDR.1/ TUR, 3 December 2009) of the in-depth review of the first national communication of Türkiye noted that Türkiye had the lowest per capita primary

energy consumption and the lowest per capita GHG emissions, among Annex I Parties. In spite of Türkiye's national circumstances which follow the typical patterns of developing countries (e.g., relatively low per capita energy use and GHG emissions, high growth rates in population and GDP, when compared with other Annex I Parties), considerable efforts have been undertaken in selected areas to contribute to GHG mitigation."

The World Bank lists Türkiye as an upper middle-income developing country. According to World Bank's data in 2020, Türkiye's gross national income was 8,600 $ per capita.. Because of this condition, Türkiye is also eligible for official development aid under the OECD Development Assistance Committee list. (FCCC/TP/2013/3). Moreover, according to World Bank data, Türkiye's per capita and total carbon emissions are lower than many developing countries that are outside Annex I list.

The Conference of the Parties has taken other decisions concerning Türkiye in the coming years. 16. The decision 1/CP.16 adopted by the Conference of the Parties has officially recognized that Türkiye's national circumstances are different from Annex-I countries and has clearly approved that Türkiye is in a different position from the developed countries and countries in transition to a market economy. This decision also requested from the Long-Term Cooperative Action Ad Hoc Working Group (AWG-LCA) established under the Convention to dwell upon Türkiye to have better access to the financing, technology and capacity-building opportunities to develop its ability to apply the provisions of the Convention more effectively.

In Durban, decision No. 2/CP.17 was taken to continue to further develop the Cancun the decisions on Türkiye

Decision No. 2/CP.17:

> *"Have agreed to continue the discussion on the procedures for providing support in mitigation, adaptation, technology development and transfer, capacity building and financing issues to assist in the implementation of the Convention..."*

Decision No. 1/CP.18 accepted in Doha reaffirmed the importance of the financial, technological and capacity-building supports to Türkiye as an Annex I Party special circumstances of which is recognized by the Conference of the Parties so that it becomes able to implement the Convention more efficiently and encouraged the Annex II countries with appropriate conditions to provide

financial, technological, technical and capacity-building supports to the Annex I countries with special position through multilateral agencies. The purpose of these supports is that these countries implement the climate change strategies and action plans in accordance with the decision No. 1/CP.16 and develop low-emission development plans. The aforementioned multilateral agencies term contains the concerned international organizations, international financial organizations, other collaborations, bilateral agreements, private sector and all types of institutional arrangements that may be deemed appropriate.

Decision No. 1/CP.18:

Parties included in Annex I to the Convention whose special circumstances are recognized by the Conference of the Parties,

Reaffirming decisions 26/CP.7, 1/CP.16 and 2/CP.17, which recognized that Türkiye is in a situation different from that of other Parties included in Annex I to the Convention; Recalling that deep cuts in global greenhouse gas emissions are required and that closing the ambition gap is a matter of urgency; Recognizing that various actions to address climate change can be justified economically in their own right and can also help in solving other environmental problems in accordance with the objectives of sustainable development;

Reaffirming the importance of financial, technological, and capacity-building support to Parties included in Annex I to the Convention whose special circumstances are recognized by the Conference of the Parties in order to assist these Parties in implementing the Convention,

1. Urges Parties included in Annex II to the Convention which are in a position to do so, through multilateral agencies, including the Global Environment Facility within its mandate, relevant intergovernmental organizations, international financial institutions, other partnerships and initiatives, bilateral agencies and the private sector, or through any further arrangements, as appropriate, to provide financial, technological, technical and capacity- building support to Parties included in Annex I to the Convention (Annex I Parties) whose special circumstances are recognized by the Conference of the Parties in or- der to assist them in implementing their national climate change strategies and action plans and developing their low-emission development strategies or plans in accordance with decision 1/CP.16;

2. Requests the secretariat to prepare, for consideration by the Subsidiary Body for Implementation at its thirty-eighth session, a technical paper identifying opportunities for Annex I Parties whose special circumstances are recognized by the Conference of the Parties to benefit, at least until 2020, from support from relevant bodies established under the Convention and other relevant bodies and institutions to enhance mitigation, adaptation, technology, capacity-building and access to finance;

3. Also requests the Subsidiary Body for Implementation, on the basis of the technical paper referred to in paragraph 95 above, to develop recommendations on this matter at its thirty-ninth session for consideration by the Conference of the Parties at its nineteenth session. "

In the decision of the Conference of the Parties, UNFCCC is requested to prepare a technical report identifying the opportunities that Türkiye (Annex I Parties whose special circumstances are recognized by the Conference of the Parties) can benefit, at least until 2020, from support from relevant bodies established under the Convention and other relevant bodies and institutions to enhance mitigation, adaptation, technology, capacity-building and access to finance, to be evaluated by the Subsidiary Body for Implementation (SBI) at the next conference. The technical report with No. FCCC/ TP/2013/3 prepared by the secretariat states clearly that Türkiye is an upper middle class rapidly growing country and that is appropriate for the official development assistance under the OECD Development Assistance Committee. According to the technical report prepared by the Secretariat, 20th Lima Conference of the Parties adopted the decisions similar to the decisions adopted in Doha at the 20th Conference of the Parties on the basis of the recommendations offered by the Subsidiary Body for Implementation (FCCC/TP/2013/3) (21/CP.20). According to this decision, the supports that can be received by Türkiye at least until 2020 from the bodies established under the Convention, other relevant bodies and institutions in order to ensure progress in areas such as mitigation, adaptation, technology, capacity building and finance. The Annex-II countries have been invited to help Türkiye with the implementation of national climate change strategies and actions plans and development of low-emission development plans and strategies in line with the decision No. 1/CP.16 by providing financial, technological, technical and capacity- building support through multinational agencies including the GEF, relevant intergovernmental organizations, international financial institutions, other

partnerships and initiatives, bilateral agencies and the private sector, or through any further arrangements, as appropriate.

Decision No. 21/CP.20:

Reaffirming decisions 26/CP.7, 1/CP.16, 2/CP.17 and 1/ CP.18, which recognized that Türkiye is in a situation different from that of other Parties included in Annex I to the Convention,

Also reaffirming the importance of financial, technological and capacity-building support to Parties included in Annex I to the Convention whose special circumstances are recognized by the Conference of the Parties in order to assist these Parties in implementing the Convention,

1. Recognizes the opportunities for Parties included in Annex I to the Convention whose special circumstances are recognized by the Conference of the Parties to benefit, at least until 2020, from support from relevant bodies established under the Convention and other relevant bodies and institutions to enhance mitigation, adaptation, technology, capacity- building and access to finance; Encourages Parties included in Annex I to the Convention whose special circumstances are recognized by the Conference of the Parties to fully utilize those opportunities; Urges Parties included in Annex II to the Convention which are in a position to do so, through multilateral agencies, including the Global Environment Facility within its mandate, relevant intergovernmental organizations, international financial institutions, other partnerships and initiatives, bilateral agencies and the private sector, or through any further arrangements, as appropriate, to provide financial, technological, technical and capacity-building support to Parties included in Annex I to the Convention whose special circumstances are recognized by the Conference of the Parties in order to assist them in implementing their national strategies, actions and plans on climate change mitigation and adaptation, and in developing their low-emission development strategies or plans in accordance with decision1/CP.16.

The Conference of the Parties having recognized Türkiye's special circumstances acknowledge that Türkiye is an upper middle-income developing country still undergoing rapid development in need of financial support to enable it to shift to a low emission and climate-resilient development pathways paradigm. Türkiye's access to financial support available to other upper middle-income

developing Parties to the Convention fulfills the principles of equity, common but differentiated responsibilities, and the right and duty to promote sustainable development as stipulated by the decision 26/CP.7 dated 2001.

To allow countries to determine their own situation in accordance with the "self-differentiation" principle, here is no definition and classification of developed/developing country in the Paris Agreement. Although Türkiye is among the Annex-1 list countries within the scope of the UNFCCC, there is no clear provision in the Paris Agreement that legally connects the countries in the Annex lists. Therefore, Türkiye signed the Paris Agreement as a developing country on April 22, 2016 during the signatory ceremony held in New York. Later on, Türkiye ratified on October 7, 2021 and become a party to the Agreement on November 10, 2021. The Republic of Türkiye declared its statement, on the basis of "equity, common but differentiated responsibilities and respective capabilities" as clearly and accurately recognized under the United Nations Framework Convention on Climate Change of 9 May 1992 and the Paris Agreement, and by recalling decisions 26/CP.7, 1/CP.16, 2/CP.17, 1/CP.18 and 21/CP.20 adopted by Conference of the Parties to the Convention, declares that it will implement the Paris Agreement as a developing country and within the scope of its nationally determined contribution statements, provided that the Agreement and its mechanisms do not prejudice its right to economic and social development.

Although this National Communication is a part of Türkiye's reporting obligation under the Convention, the fact that this communication was prepared and submitted will not prejudice Türkiye's ratification status of the Paris Agreement with the declaration and the understanding of a developing country. It will not cause it to be referred to as a developed country in the global-scale exercises to be carried out within the scope of the Paris Agreement.

3 INVENTORY OF GREENHOUSE GAS EMISSIONS AND SINKS

3.1 GREENHOUSE GAS EMISSION TRENDS

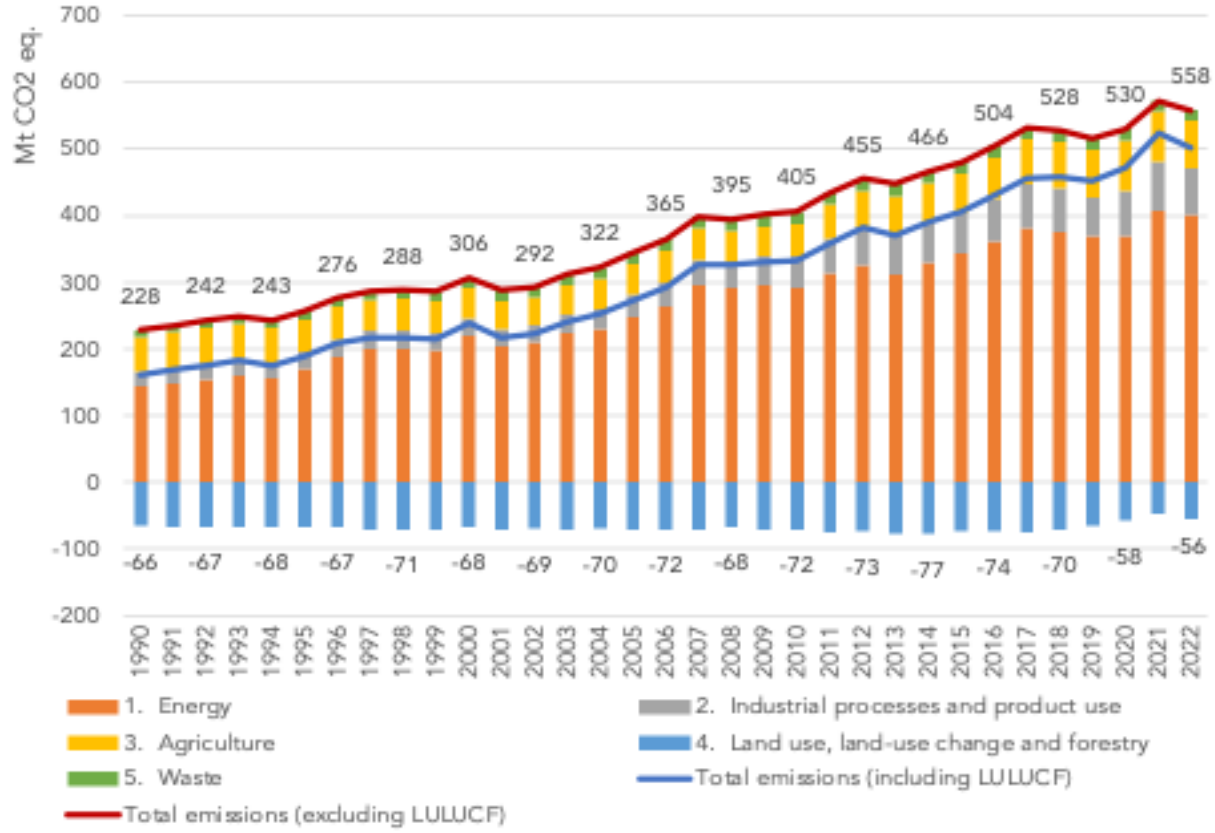
Türkiye, as an Annex I party to the United Nations Framework Convention on Climate Change (UNFCCC), reports annually on greenhouse gas (GHG) inventories. The latest GHG inventory submission contains national GHG emission/removal estimates for the period of 1990-2022.[92] The emissions presented in this document are those communicated in the 2024 submission to the UNFCCC Secretariat. A complete description of the factors underlying the Turkish emission trends, the rationale for the choice of methodologies, the emission factors and parameters used to estimate emissions for the relevant sectors is provided in the National Inventory Document, and CRT tables.[93]

Türkiye's total GHG emissions were 558.3 Mt CO2 eq. excluding the LULUCF, and 502.2 Mt CO2 eq., including the LULUCF in 2022. The energy sector was the highest contributor with 400.1 Mt CO2 eq. followed by agriculture with 71.5 Mt CO2 eq., industrial processes and other product use (IPPU) with 69.9 Mt CO2 eq., and waste with 16.3 Mt CO2 equivalent. Regarding their shares, the energy sector has the highest percentage with 71.8%, agriculture has 12.8%, industrial processes and other product use (IPPU) has 12.5%, and waste has 2.9%. (Figure 38, Table 10)

The emissions across most sectors showed notable annual changes from 2021 to 2022. Emissions in the energy sector decreased by 1.4%, in IPPU (Industrial Processes and Product Use) by 6.4%, and in agriculture by 5.1%. In contrast, emissions in LULUCF increased by 17.2%, while the waste sector saw a 5.5% rise. In the long term, all sectors except the LULUCF have an increasing trend from 1990 to 2022. Energy sector emissions increased by 180% compared to 1990. During the same period, IPPU sector emissions increased by 208%, agricultural sector emissions increased by 38%, and waste sector emissions increased by 58%.[94] (Figure 39) The LULUCF emissions decreased 15%. The main reasons for the increase for all sectors were population growth, a growing economy and an increase in energy demand.

[92] NID, 2024.
[93] NID, 2024 and CRT, 2024.
[94] NID, 2024.

Figure 38 - Greenhouse gas emissions/removals, Mt CO2 eq., 1990-2022[95]



[95] Data source: CRT, 2024.

Figure 39 - GHG emission trend by sectors, Mt CO2 eq., 1990-2022[96]

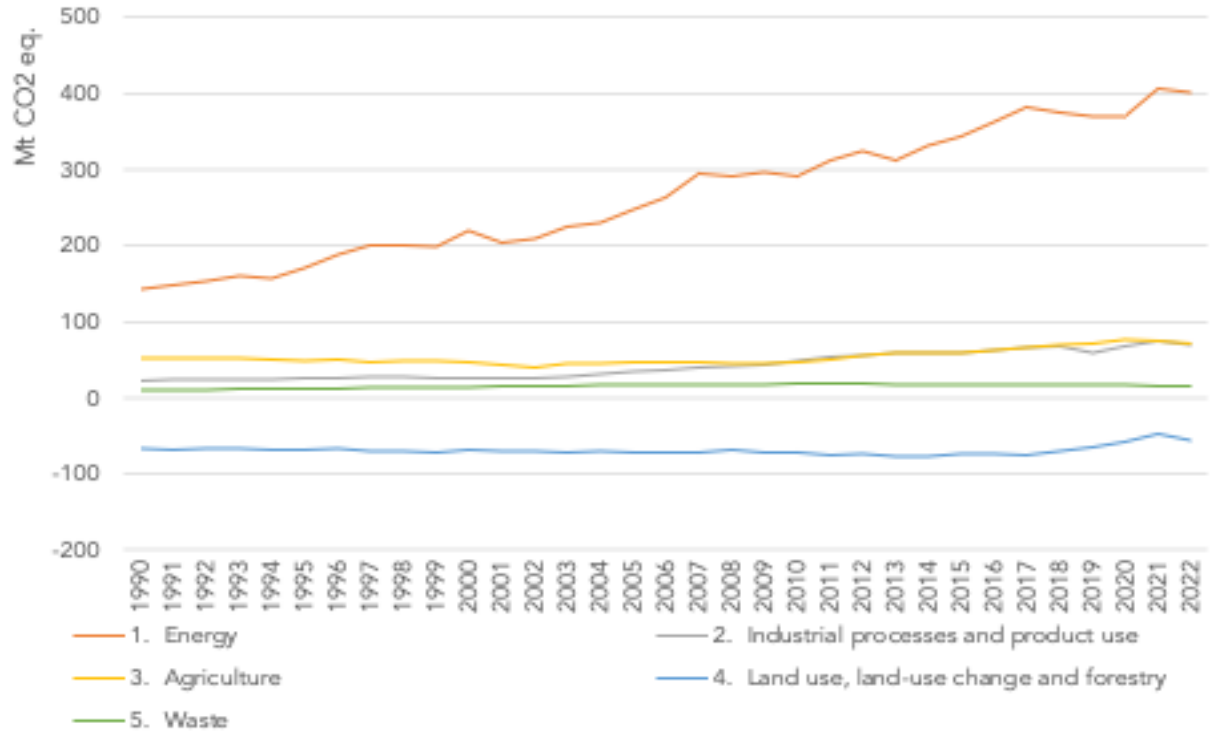


Table 10 - Greenhouse gas emissions/removals, Mt CO2 eq., 1990-2022

Year	Energy	IPPU	Agriculture	LULUCF	Waste	Total (without LULUCF)	Total (with LULUCF)
1990	143.1	22.7	51.8	-66,4	10.3	228.0	161,6
1995	170.0	25.4	49.0	-67,9	12.1	256.5	188,5
2000	219.8	26.1	46.0	-68,2	14.5	306.4	238,2
2005	247.7	34.0	46.3	-72,2	16.9	344.8	272,6
2010	290.9	48.6	47.7	-72,1	18.1	405.3	333,2
2015	344.0	59.2	59.2	-72,9	17.7	480.1	407,2
2016	361.9	63.2	61.7	-73,7	17.3	504.1	430,4
2017	381.8	66.1	66.3	-76	16.9	531.1	455,1

[96] Data source: CRT, 2024.

2018	374.7	67.1	68.9	-70,4	17.3	528.1	457,7
2019	368.9	58.4	71.5	-64,3	16.8	515.6	451,3
2020	369.5	67.2	76.4	-57,6	17.0	530.2	472,5
2021	406.5	74.7	75.4	-47,9	15.4	572.0	524,1
2022	400.6	69.9	71.5	-56,1	16.3	558.3	502,2
Change (%) from base to latest reported year	180%	208%	38%	-16%	58%	145%	211%

3.1.1 GENERAL FACTORS UNDERLYING EMISSION TRENDS

Türkiye's GHG emission trends are highly correlated with GDP growth rate. The total and net GHG emissions trends are similar to the trend in GDP for 1990-2022 periods. There is an increasing trend in the total emissions over the period of 1990-2022. However, for year 1994, 1999, 2001 and 2008 the GHG emissions decreased due to economic slowdown in those years. The GHG emissions decreased by 2.7%, 0.4%, 6.3% and 0.8% respectively as compared to the previous years in these mentioned years.

The fluctuations in the emission trends are mainly due to the trends in economic activities. Therefore, GDP can be thought as the main driver of the GHG emissions in Türkiye. It has nearly the same pattern as total GHG emissions for the period 1990-2022. It reached 906 billion USD in 2022 from 149 billion USD in 1990.

Population data is another driver of the emission trends in national inventories. The mid-year population of Türkiye increased about 55% for the period 1990-2022. While it was 55 million in 1990, it reached 85 million in 2022. Türkiye's per capita GHG emission was 4.14 t CO2 eq. in 1990 and increased to 6.55 t CO2 eq. in 2022.[97] Despite both the GDP and GHG emissions of Türkiye increasing, the rate of increase in GHG emissions is significantly lower than that of GDP growth. The primary reasons for this decoupling of GHG emissions from GDP growth relate to two main factors. Firstly, it is primarily due to strategic policies and measures implemented in the energy sector, which have led to an increased share of non-fossil fuel electricity production and improvements in energy efficiency. Secondly, external factors, including the cumulative impact of US dollar inflation from 1990 to 2022 and the global repercussions of the COVID-19 pandemic, have also

[97] NID, 2024

influenced the data. Additionally, recent policy shifts have fostered a decoupling effect, where economic growth no longer leads to a proportional increase in greenhouse gas emissions. This trend is anticipated to strengthen in the years ahead.

Figure 40 - Trends in emissions per capita and dollar of GDP relative to 1990[98]

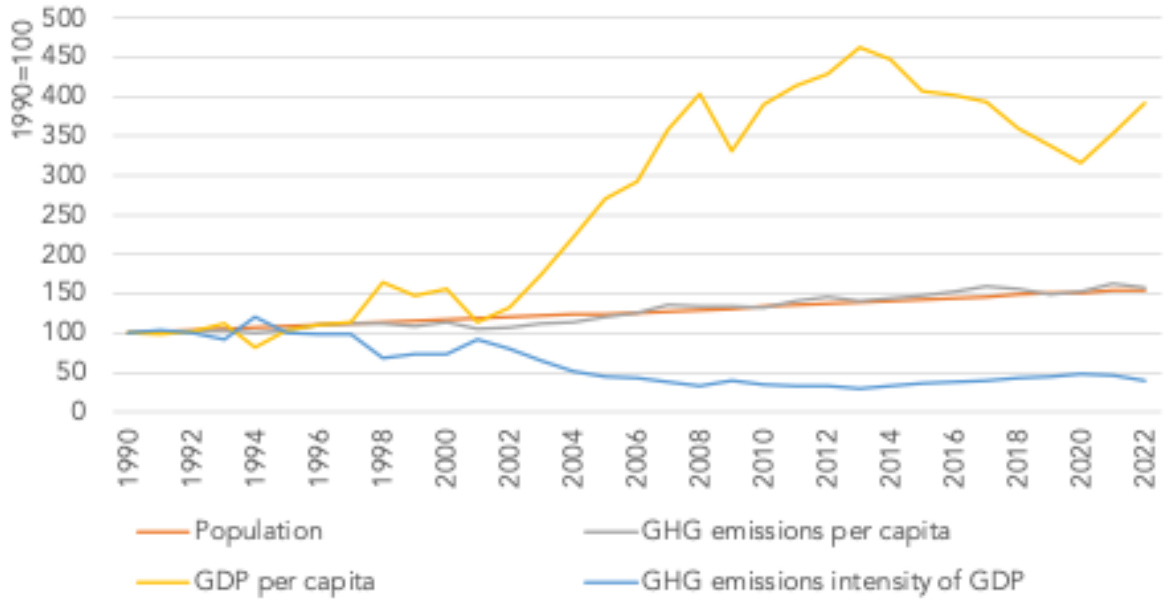
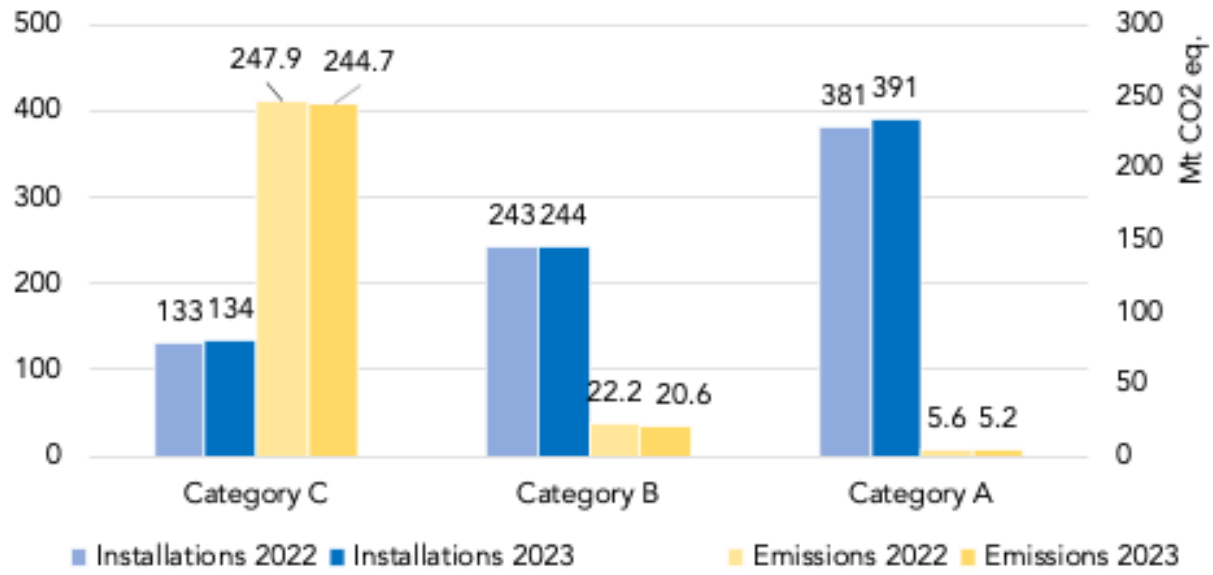


Figure 40 shows trends on various statistics related to Turkish greenhouse gas emissions normalized to 1990 as a baseline year. The direction of the emission intensity trend started to change after 2002. GDP (in current price) peak in 2013 and began to decline while population and emissions per capita continued to increase. After the COVID, GDP per capita (in current price) started to increase back.

In Türkiye, within the scope of the Regulation on the Monitoring of Greenhouse Gas Emissions and related communiqués, greenhouse gases originating from thermal power plants and industrial sectors have been monitored at the operation/facility level since 2015. Figure 41 shows the total GHG emissions from the 769 facilities registered in the MRV system in 2023 and compares this data with 2022. Total emissions under the MRV system in 2023 amounted to 270.6 Mt CO_2 eq., representing approximately half of the country's total greenhouse gas emissions. In comparison, 757 installations emitted 275.8 Mt CO_2 eq. in 2022.

[98] Data sources: CRT, 2024; TurkStat, 2021_a

Figure 41 –GHG emissions from installations under the scope of MRV system (2022-2023)



3.1.2 GHG EMISSION TRENDS BY GAS

At the 2022 GHG inventory, out of the total greenhouse gas emissions, carbon dioxide (CO2) contributed the highest share of 75.4%, followed by methane (CH4) with 15.6%, nitrous oxide (N2O) with 7.7%, and fluorinated gases (F-gases) with 1.3%. Total CO2 emissions (excluding LULUCF) increased by 186% from 1990 to 2022. CH4 emissions (excluding LULUCF) increased by 41% and N2O emissions (excluding LULUCF) increased by 55%. Total CO2 emissions (including LULUCF) increased by 339% from 1990 to 2022. There were no significant changes in other GHGs by taking into account the LULUCF sector. CH4 emissions (including LULUCF) increased by 41% and N2O emissions (including LULUCF) increased by 55%.

In terms of evaluation of each main GHG gases, CO2 emissions show a general increasing trend, while N2O and CH4 emissions were not changing considerably in comparison with the CO2. (Figure 42)[99]

[99] NID, 2024

Figure 42 - Emission trend of main GHGs, 1990-2022[100]

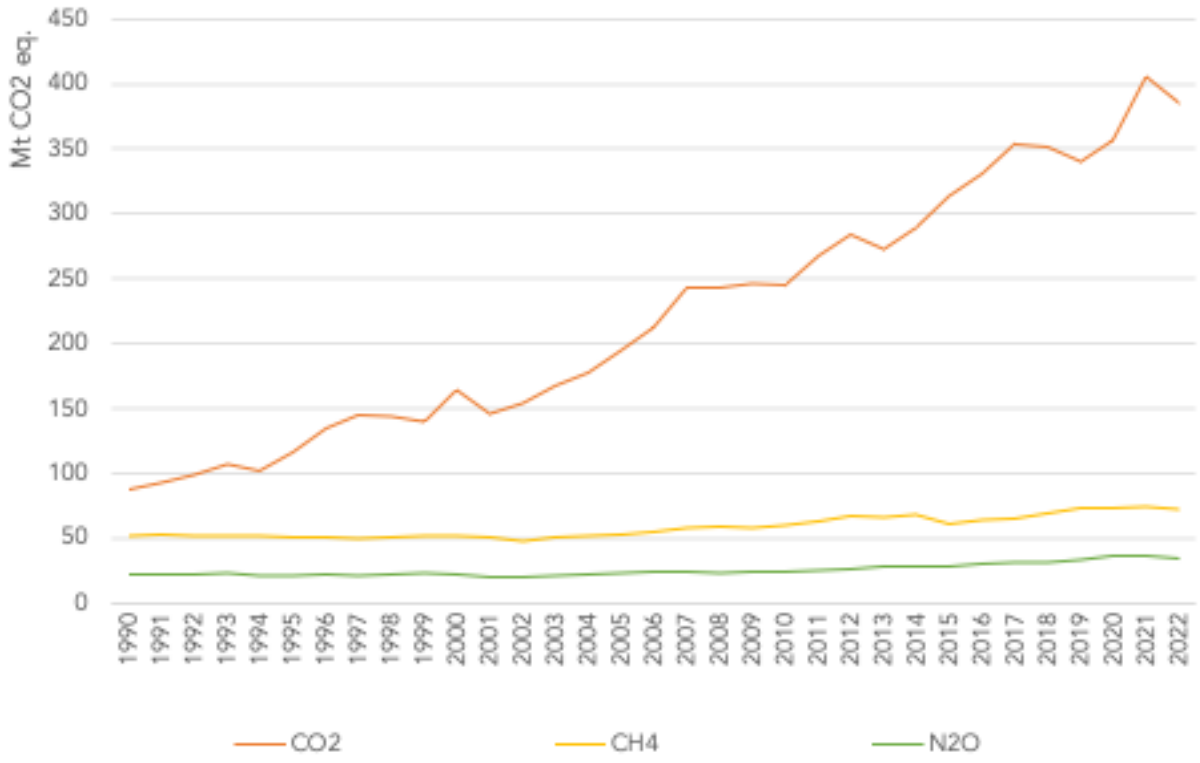


Table 11 - Aggregated GHG emissions excluding LULUCF, Mt CO2 eq., 1990-2022[101]

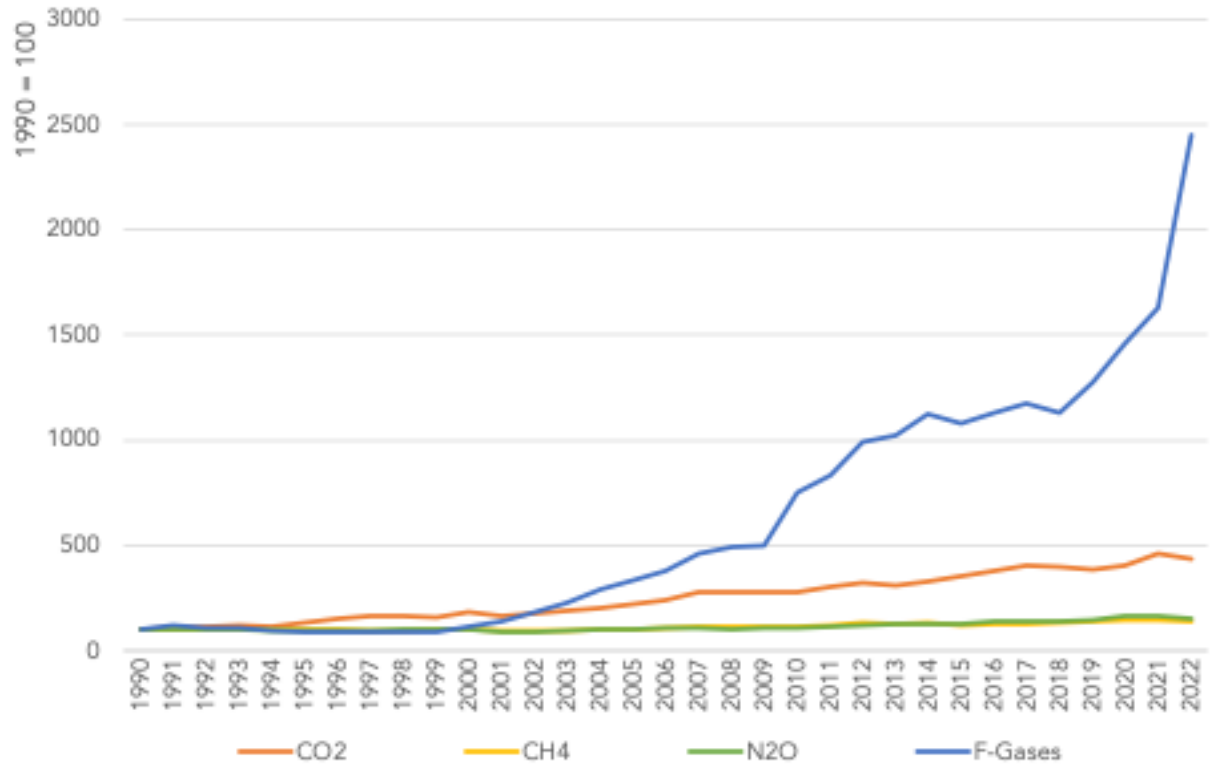
Gas	1990	2000	2005	2010	2015	2020	2021	2022	Change (%) from base to latest reported year
Total	228.0	306.4	344.8	405.3	480.1	530.2	572.0	558.3	145%
CO2	154.1	232.4	267.0	317.6	386.3	414.4	455.2	441.4	186%
CH4	51.3	51.5	53.3	60.1	60.5	73.5	73.9	72.2	41%
N2O	22.2	22.0	23.1	24.4	28.6	36.1	35.9	34.3	55%
HFCs	NO	0.1	1.0	2.8	4.4	6.0	6.7	10.2	N/A
PFCs	0.4	0.4	0.4	0.3	0.1	0.0	0.0	0.0	-98%

[100] Data source: CRT, 2024.
[101] NID, 2024.

SF6	NO	0.0	0.0	0.1	0.1	0.2	0.2	0.2	N/A

Figure 43 shows trends in the index for each year compared to previous year by gas for the 1990-2022 period. 1990 is assumed as "100" for indexing. All gases were showing an increasing trend compared to 1990 and also to previous years in general. The sharpest trend belongs to F-gases since they increased almost 25 times in proportion to 1990. F-gas emissions have shown a rapid increase particularly in recent years. However, their total share in overall greenhouse gas (GHG) emissions was only 1.3% in 2022.

Figure 43 - Trends in emissions by gas relative to 1990[102]



3.1.3 INDIRECT GHG EMISSIONS

Emission trends of NOX, CO, NMVOC, NH3 and SO_X from 1990 to 2022 are given in below Table 12. While four indirect gases have an increasing trend from 1990 to

[102] Data source: CRT, 2024.

2022 including NOX (693%), SOX (389%), CO (80%) and NMVOC (57%), one gas have a decreasing trend, NH3 (69%).[103]

Table 12 - Total emissions for indirect greenhouse gases, kt, 1990-2022[104]

Gas	1990	2000	2010	2015	2020	2021	2022	Change (%) from base to latest reported year
NOX	124	1262	979	961	956	981	983	693%
CO	886	7660	3333	2366	1910	1890	1593	80%
NMVOC	727	1447	1104	1095	1177	1174	1142	57%
SOX	560	710	2473	1959	2310	2700	2738	389%
NH3	88	96	62	50	46	39	27	-69%

In terms of annual change for each gas from 2021 to 2022. There is not a specific pattern. The gases having increasing trends are NOX (0.2%), SOX (1.4%). The gases that have decreasing trends are CO (15.7%), NMVOC (2.7%) and NH3 (30.8%).[105]

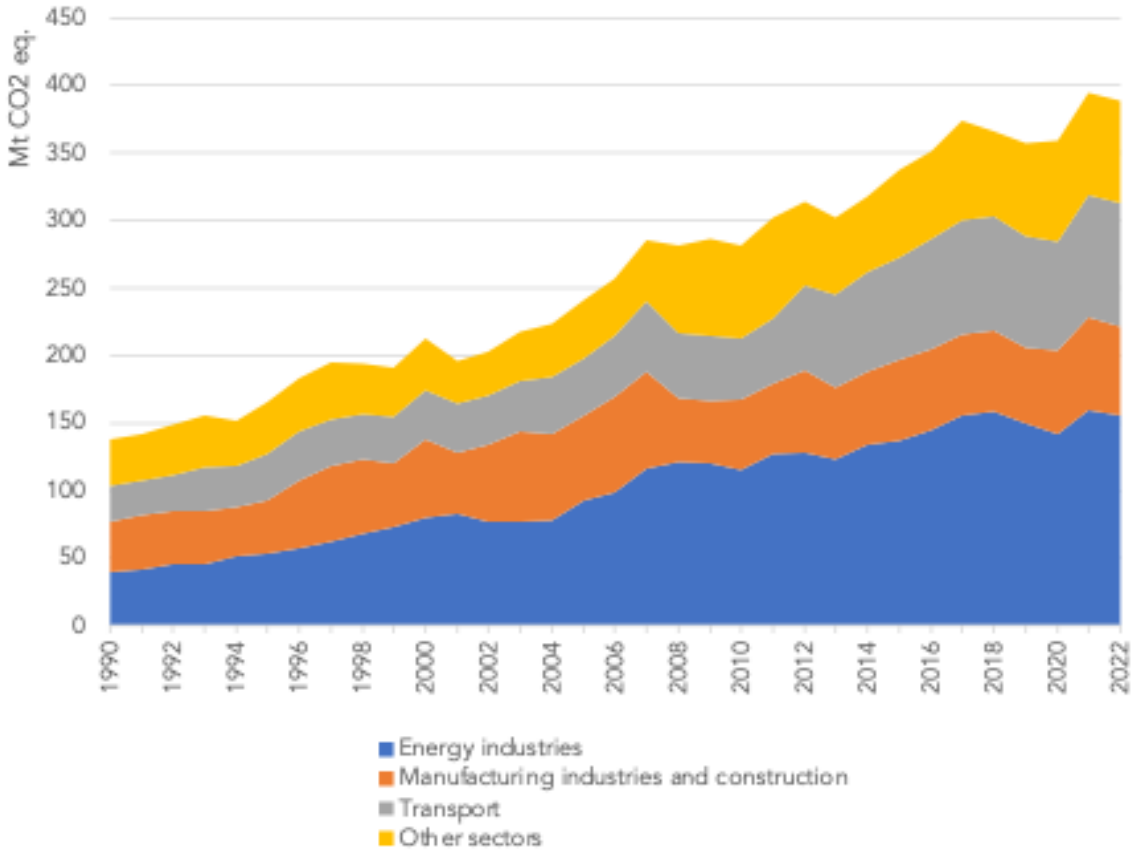
3.2 GREENHOUSE GAS EMISSIONS BY SECTOR

3.2.1 ENERGY

Energy sector is the major source of Turkish anthropogenic GHG emissions. In overall 2022 GHG emissions (excluding LULUCF), the energy sector had the largest portion with 71.8%. Energy sector CO2 emissions constituted 86.6% of total CO2 emissions in 2022. The non-CO2 emissions from energy-related activities represented rather small portion of the total national emissions. Energy sector CH4 emissions were 19.9% of total national CH4 emissions and its N2O emissions were 11.2% of total N2O emissions in 2022.[106]

[103] NID, 2024.
[104] NID, 2024.
[105] NID, 2024.
[106] NID, 2024.

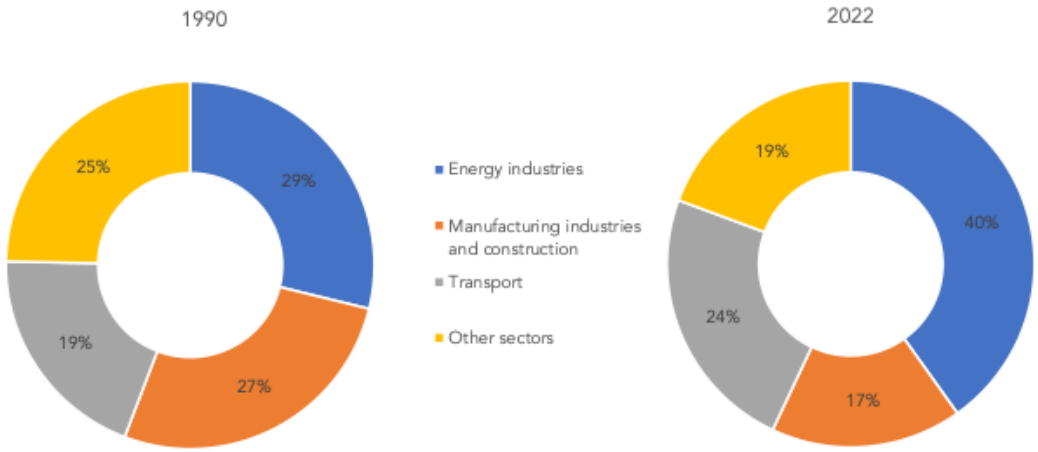
Figure 44 – Energy Sector Emissions, 1990-2022[107]



Total emissions from the energy sector for 2022 were estimated to be 401 Mt CO2 eq. Energy industries were the main contributor, accounting for 38.9% of emissions from the energy sector. It is followed by the transport sector with 22.9%, other sector (fuel consumption at buildings and other emissions) with 18.8% and manufacturing industries with 16.3%.[108]

[107] Data source: CRT, 2024.
[108] NID, 2024.

Figure 45 - Fuel combustion CO2 eq. emissions by sectors, 1990 and 2022[109]



Energy sector GHG emissions increased by 180% between 1990 and 2022 whereas annual emissions from 2021 to 2022 decreased by 1.4% (5 886 Kt CO2 eq.). Energy sector GHG emissions mainly were coming from stationary combustion. Total emissions from stationary combustion were 297 Mt CO2 eq. in 2022, equal to 53% of total national GHG emissions (excluding LULUCF).[110]

Between 2021 and 2022, energy industries, manufacturing industries and construction and other sectors show 2.1%, 4.5% and 0.4% decrease respectively while the transport sector show 0.9% increase.[111]

Table 13 – Total emissions from fuel consumption by sectors, Mt CO2 eq., 1990-2022[112]

Year	Energy	Fuel Combustion Total	Energy Industries	Manufacturing Industries and Construction	Transport	Other sectors
1990	143,147	137,752	39,701	37,157	26,912	33,982
1995	169,979	165,187	53,199	39,990	34,041	37,957
2000	219,764	212,388	80,116	57,928	36,408	37,936

[109] Data source: CRT, 2024.
[110] NID, 2024.
[111] NID, 2024
[112] NID, 2024.

2005	247,665	240,836	93,006	62,996	41,980	42,853
2010	290,938	281,078	115,387	52,326	45,346	68,020
2015	343,985	337,584	136,984	59,578	75,713	65,310
2020	369,521	359,344	141,859	61,593	80,585	75,307
2021	406,472	394,390	159,351	68,537	91,087	75,415
2022	400,586	388,408	155,937	65,463	91,866	75,142

Between 2021 and 2022, Türkiye's energy sector emissions, especially energy industries sector emissions dropped. The primary factor driving the reduction in emissions from energy resources is attributed to changes in electricity and heat production. By increasing the proportion of renewables in the energy mix from 29.6% in 2017 to 42.4% in 2022, emissions in this sector have decreased. Concurrently, the share of fossil fuel-based electricity generation dropped from 70.4% in 2017 to 57.6% in 2022. However, as a long-term trend, between 1990 and 2022, Türkiye's energy industries sector emission continued to increase. This increase is mainly a result of increased energy demand. As a result, Türkiye generated 57,543 GWh of electricity in 1990, which increased to 297.277 GWh in 2017 and further to 328,379 GWh in 2022. However, while the demand is increase, Türkiye is successfully controlling GHG emissions from this increase at a lower increase rate, underscoring the effectiveness of transitioning towards renewable energy sources in reducing emissions.

Energy Industries

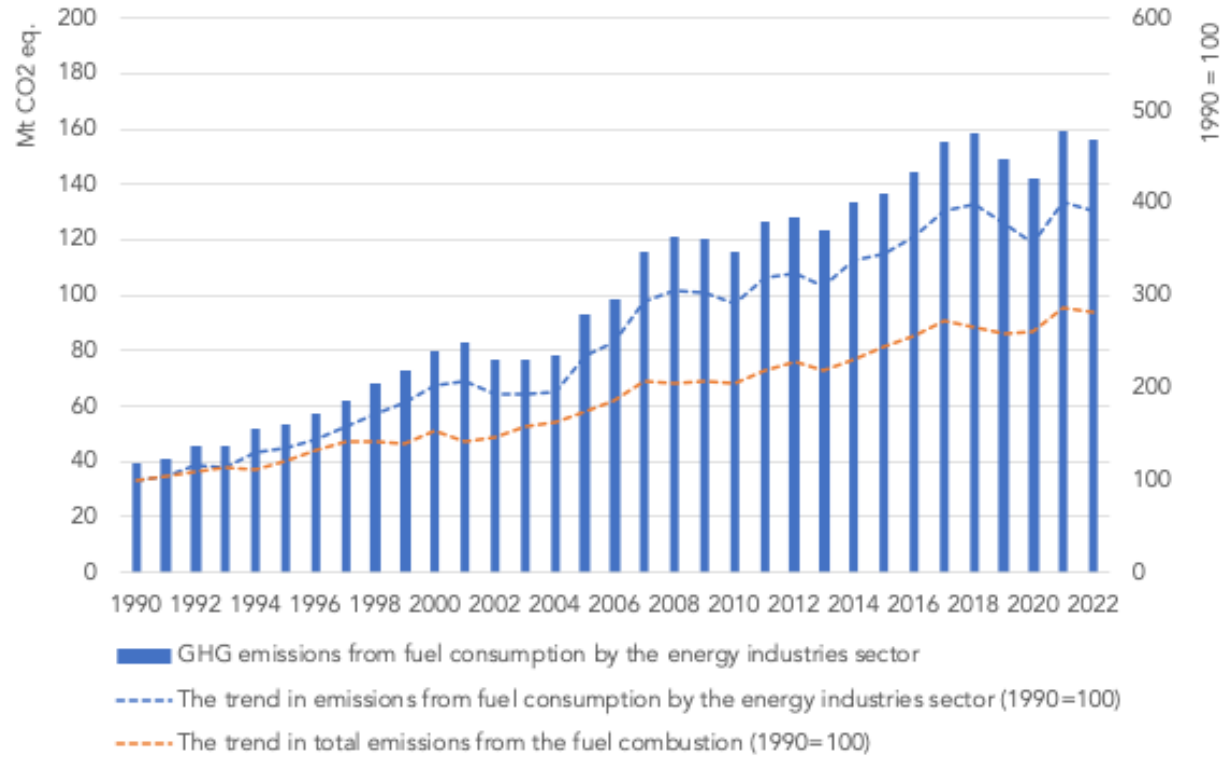
In the energy industry sector, emissions were 39.70 Mt CO_2 eq. in 1990, rising to 159.35 Mt CO_2 eq. in 2021 and slightly decreasing to 155.94 Mt CO_2 eq. in 2022. This reflects a 293% increase from 1990 to 2022, with a 2.1% decrease compared to the previous year. Notably, emissions were at 155.66 Mt CO_2 eq. in 2017. Thus, despite increases in electricity generation and consumption over the last five years, GHG emissions have not risen, largely due to the growing share of renewable energy in electricity generation.

However, the increase in emissions within the energy industry sector remains higher than the overall trend for the entire fuel consumption sector. Using 1990 levels as a baseline (100), total emissions from fuel consumption increased to 282, while emissions specifically from the energy industry sector increased to 393. In

other words, the share of energy industries in total fuel consumption increased from 28.8% in 1990 to 40.1% in 2022.

Energy industries main sub sector is the public electricity and heat production category includes electricity and heat production of all electricity generation installations in operation, including auto producers. Auto producers were the facilities that produce electricity that they use for their purposes. By the end of 2022, total installed capacity reached 103,809 MW with a 4% increase from the previous year and nearly 6 times higher than the 1990 values. The total gross electricity consumption decreased by 1% in 2022 compared to the previous year. In 2022, gross consumption was 327,221 GWh; meanwhile, in 2021, this figure was realized as 328,405 GWh. The he details on energy industries have been provided in the Electricity Section within the National Circumstances Chapter.

Figure 46 – The Trend in the Emissions from Fuel Consumption by the Energy Industries Sector (1990-2022)[113]

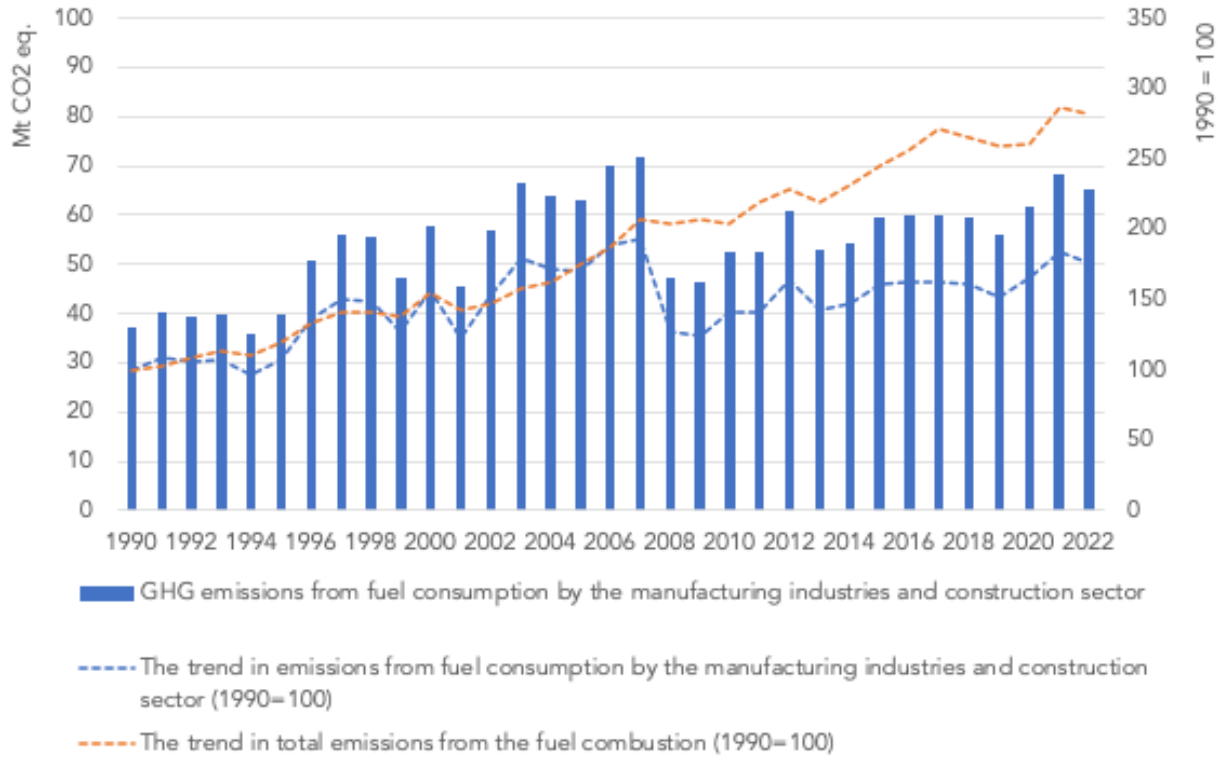


[113] Data source: CRT, 2024.

Manufacturing Industries and Construction Sector

In 2022, manufacturing industries and construction sector contributed to 65.5 Mt CO2 eq. emissions (Table 13). Increase trend in emissions from fuel consumption by manufacturing industries and construction sector was lower than the increase trend of emissions from fuel consumption by all sectors. (Figure 47) As a result, GHG emissions (in CO2 eq.) by the manufacturing industries and construction sector as a share of total emissions from fuel combustion decreased from 27.5% in 1990 to 16.8% in 2022.

Figure 47 – The Trend in the Emissions from Fuel Consumption by the Manufacturing Industries and Construction Sector (1990-2022)[114]



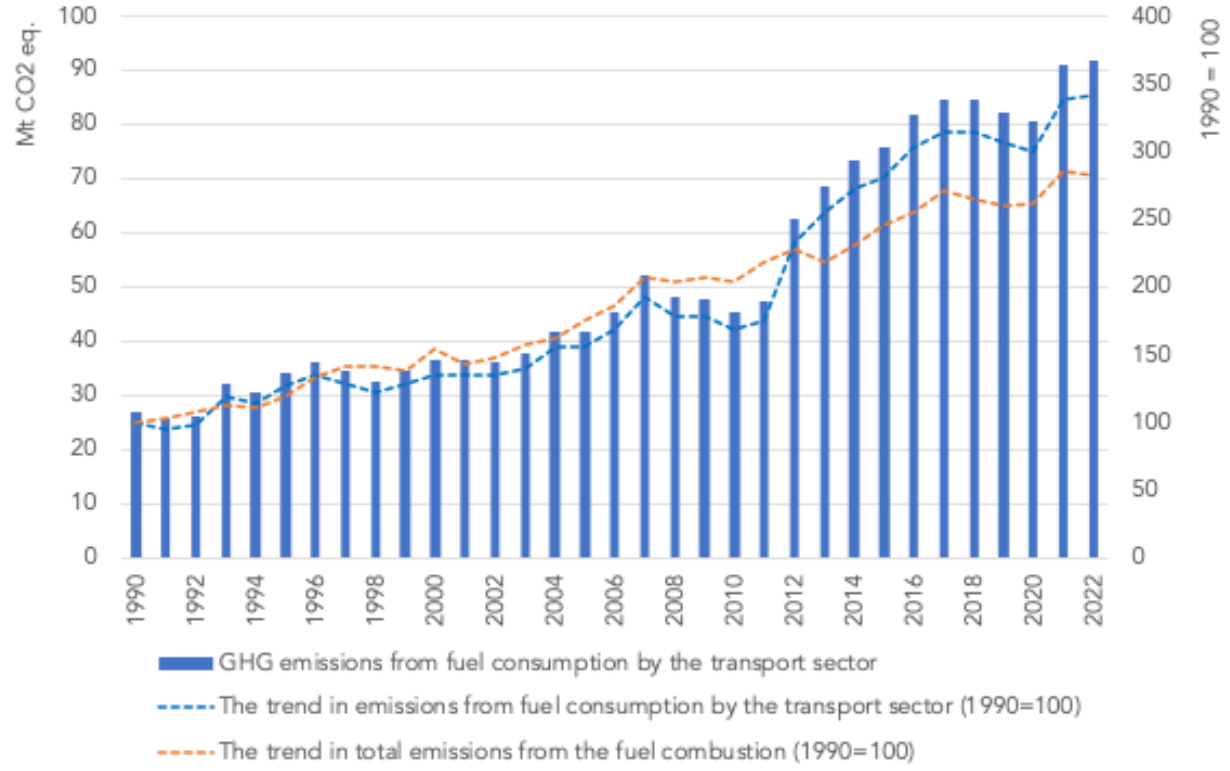
Transport

In 2022, transport sector contributed to 91.9 Mt CO2 eq. emissions (Table 13). Increase trend in emissions from fuel consumption by the transport sector was higher than the increase trend of emissions from fuel consumption by all sectors. (Figure 48) As a result, GHG emissions (in CO2 eq.) from transport sector as a share

[114] Data source: CRF, 2022.

of total emissions from fuel combustion increased from 20% in 1990 to 23.7% in 2022.

Figure 48 – The Trend in the Emissions from Fuel Consumption by the Transport Sector (1990-2022)[115]



As shown in below Figure 49, road transportation was the major CO2 source contributing to 94.1% of transport emissions in 2022. Contribution of domestic aviation was 3.7%, domestic water-borne navigation was 1.2%, and railways was 0.6% in 2022. The share of pipeline transportation was 0.5%.

[115] Data source: CRT, 2022.

Figure 49 - GHG emission by transport mode, 1990-2022[116]

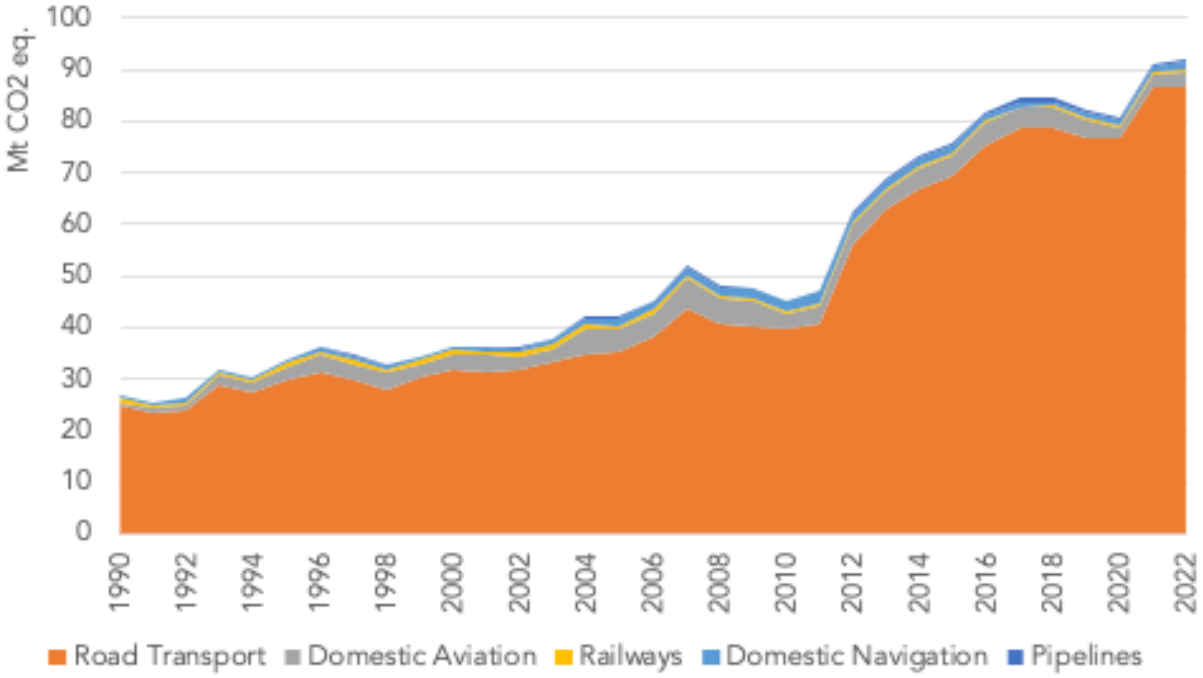
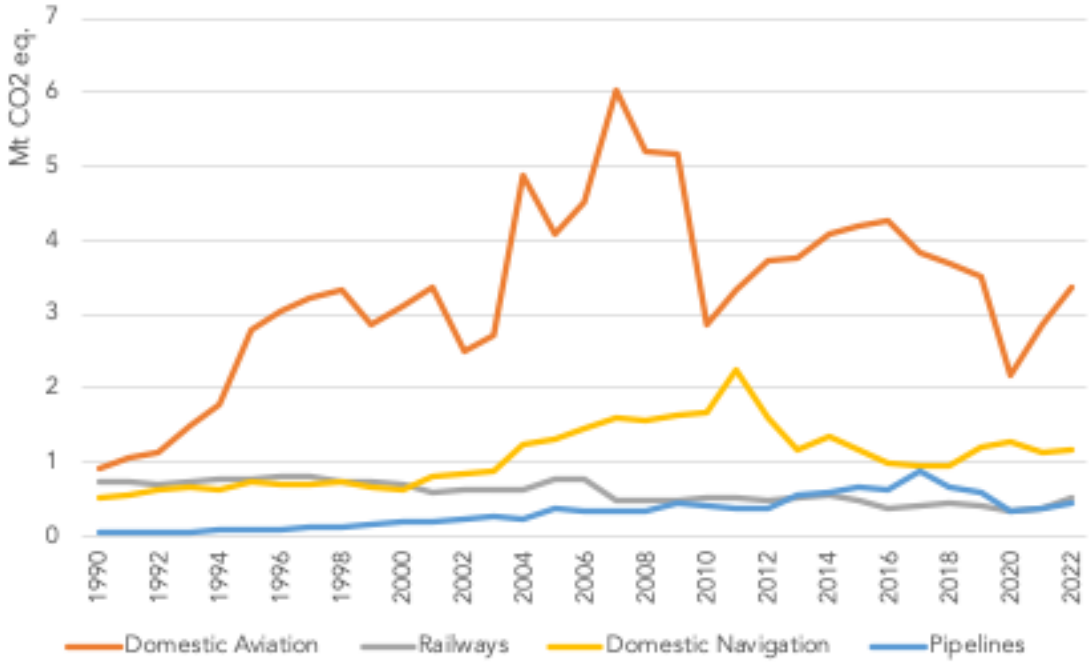


Figure 50 - GHG emission trend by transport mode except road transportation, 1990-2022[117]

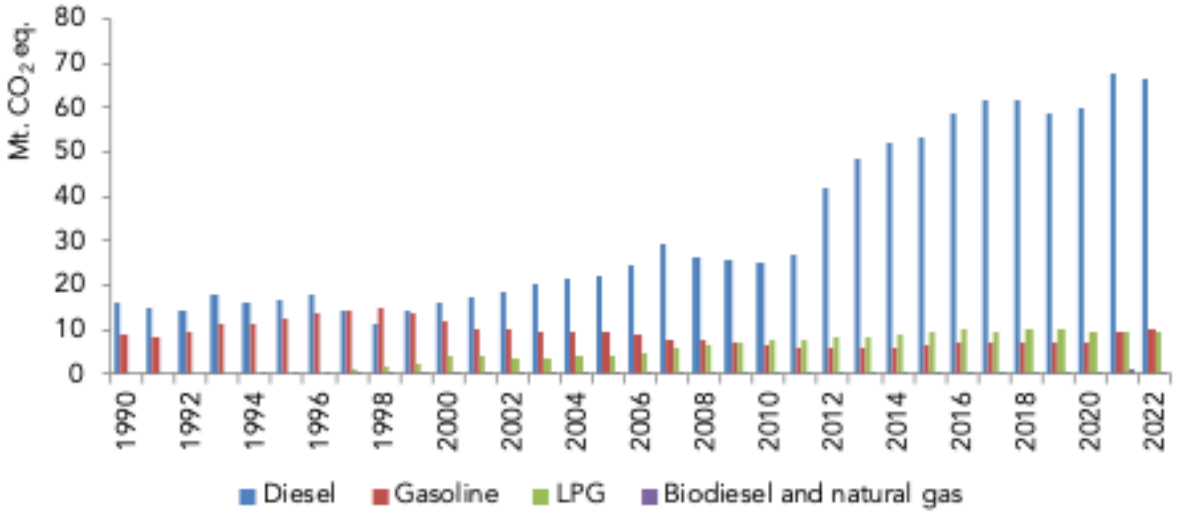


[116] Data source: CRT, 2022.
[117] Data source: CRT, 2022.

In road transportation, only diesel oil and gasoline were used until the year 1997. Utilization of LPG started in 1997 and consumption increased steadily. Then, diesel oil consumption and LPG consumption increased while gasoline consumption declined. From 2007 to 2010 period slowdown of economy was the main reason in decrease of diesel oil consumption, diesel oil consumption decreased probably because of the global economic crisis. After that, there was remarkable rise in diesel fuel oil consumption.

When analyzed in detail, it is determined that data of diesel fuel used in agriculture sector have not been separated from those used in road transportation since 2011. That is why there was a large increase in GHG emissions resulting from diesel fuel between 2011 (26,579 kt. CO2 eq.) and 2022 (65,652 kt. CO2 eq.), an increase of 150%. Therefore, whole increase in use of diesel fuel should not be attributed to transportation sector.

Figure 51 - Emission distributions by fuel types in road transportation (1990-2022)[118]

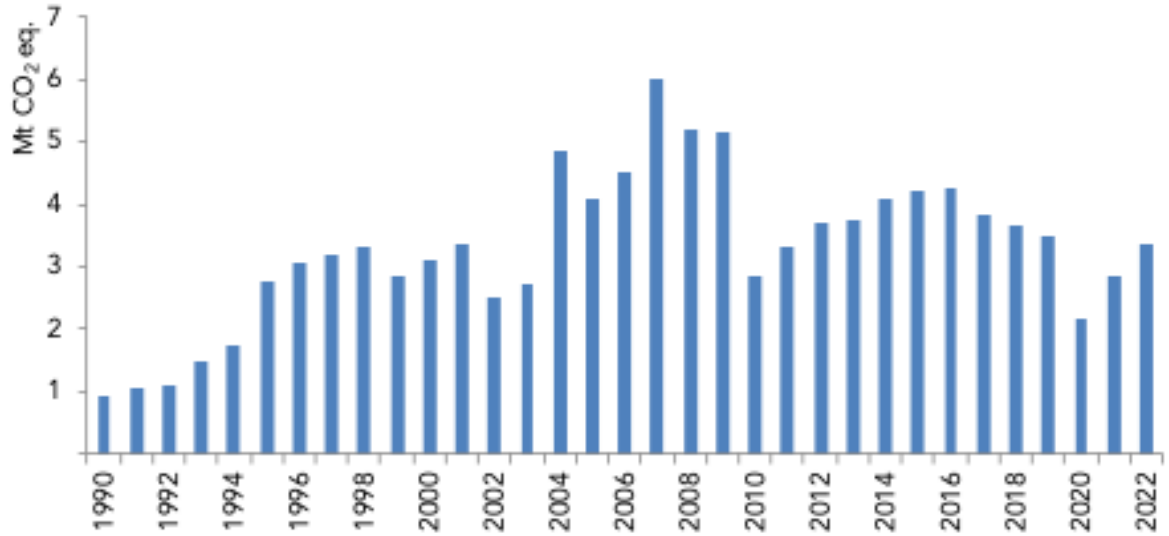


The domestic aviation source category was a key category in 2022, in terms of both the level and trend analysis of CO2 emissions from the jet fuel. In domestic aviation only jet fuel was consumed. The total emissions and the emissions of CH4 and N2O increasing trends as CO2 eq. CO2 eq. emissions have increased approximately 348% since 1990 and reached to 3.37 Mt CO2 in 2022. The calculated amounts of CH4 and N2O emissions were 1.51 kt. CO2 eq. and 30.51 kt. CO2 eq. in 2020 respectively. There was a relatively large decrease in CO2 emissions observed between 2009 and 2010 (44% decline) owing to the global

[118] Data source: CRF, 2022.

economic crisis. Additionally, there was a significant decline due to COVID in 2020 and 2021. However, an overall increase is observed between 2020 and 2022.

Figure 52 - GHG emissions for domestic aviation, Mt CO2 eq., 1990-2022[119]

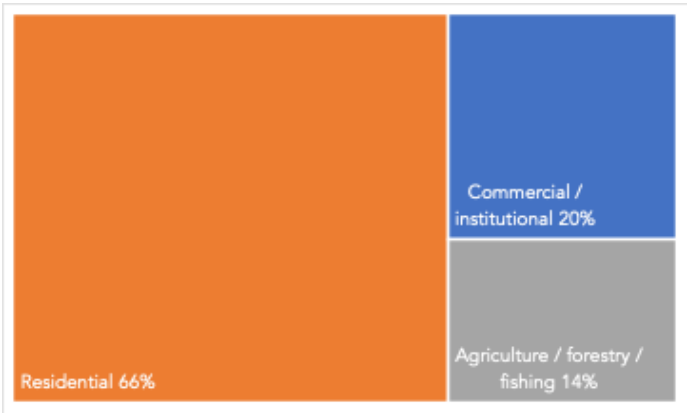


Other Sectors

In 2022, other sectors category, which consist of emissions from fuel consumption at residential, commercial, and institutional buildings and at agriculture, contributed to 75.1 Mt CO2 eq. emissions (Table 13). The emissions that are included in this category mainly arise from fuel consumption at residential buildings, which was 66% of the total of the category. Emissions from fuel consumption at commercial/institutional buildings had 20%, and fuel consumption in agriculture had 14% in the total of other sectors' emissions.

[119] Data Source: NID, 2024.

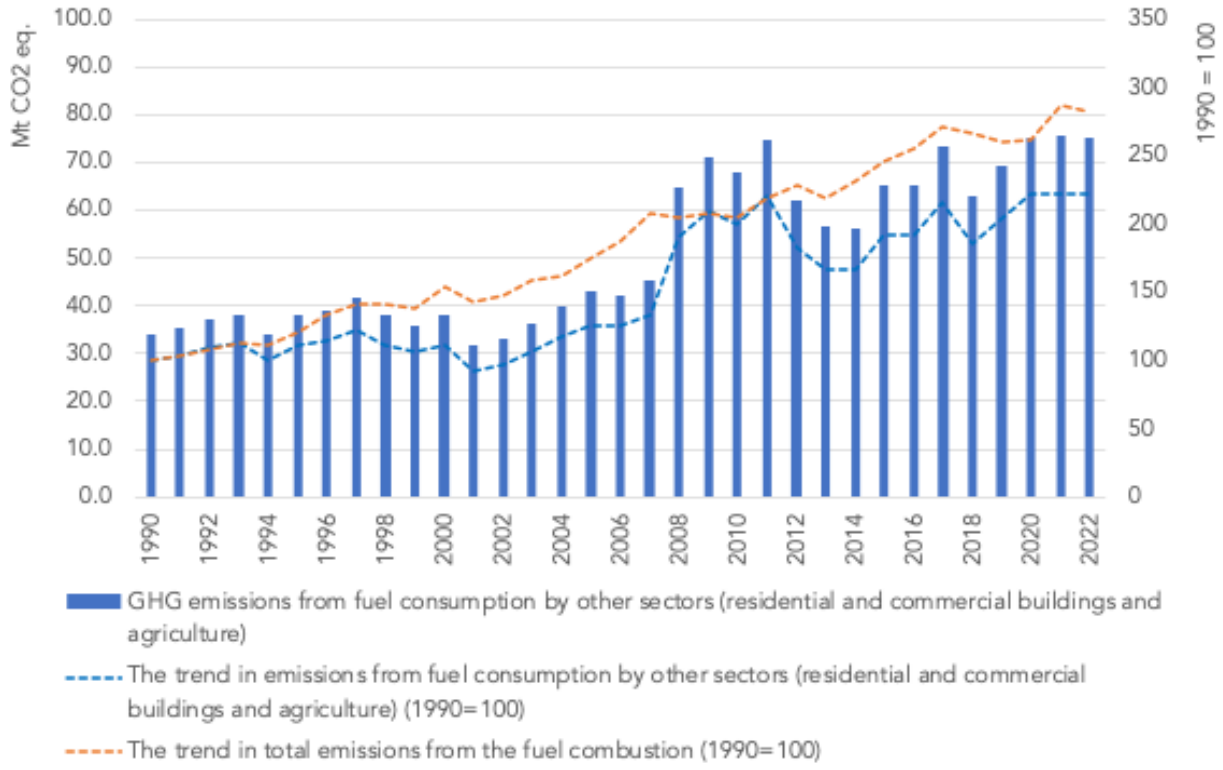
Figure 53 – GHG Emissions by Sub-Sectors within the 'Other Sectors' Category (2022)[120]



Increase trend in emissions from fuel consumption by the other sectors category was lower than the increase trend of emissions from fuel consumption by all sectors. (Figure 54) As a result, GHG emissions (in CO2 eq.) by the other sectors category as a share of total emissions from fuel combustion decreased from 23,7% in 1990 to 19% in 2022.

[120] Data source: CRT, 2022.

Figure 54 – The Trend in the Emissions from Fuel Consumption by the Other Sectors (1990-2022)[121]



Fugitive Emissions

Fugitive emissions include fugitive emissions from extraction, processing, storage and transport of fossil fuels. CH4 emission from coal mining, CH4, CO2, N2O and NMVOC emissions from exploration, production/processing, transport/transmission, refining and storage of oil and natural gas were covered.

Table 14 - Fugitive emissions from fuels, kt, 1990-2022[122]

Year	CO_2	CH_4	N_2O	$CO_{2\ eq.}$
1990	220	185	0.0031	5,395
2000	168	257	0.0023	7,376
2010	156	347	0.0021	9,860
2015	155	223	0.0021	6,401

[121] Data source: CRT, 2022.
[122] NID, 2024

2020	195	356	0.0027	10,177
2021	210	424	0.0029	12,082
2022	218	427	0.003	12,178

CO2 and CH4 were the main fugitive emissions in this category. CH4 was emitted mainly from coal mining while CO2 was emitted from venting and flaring. Fugitive emissions as CO2 eq. have become 12,178 ktons in 2022.

Table 15 - Fugitive emissions from fuels by subcategory, 1990-2020 (kt CO2 eq.)[123]

Year	Total	Solid Fuels	Oil and Natural Gas
1990	5,395	4,401	994
2000	7,376	5,930	1,446
2010	9,860	7,554	2,306
2015	6,401	3,324	3,076
2020	10,177	6,814	3,362
2021	12,082	7,969	4,113
2022	12,178	8,332	3,846

Total fugitive emissions for 2022 were 12.18 Mt CO2 eq., representing 2.18% of total GHG emissions (excluding LULUCF). Solid fuels contributed 68.4% and oil and natural gas systems were accountable for the remaining 31.6% of fugitive emissions. Overall fugitive emissions increased by 125.7% between 1990 and 2022. In 2014 a serious mining accident happened, and many underground mines were closed in the following year as a precaution, therefore in 2015 fugitive emissions were decreased remarkably. In overall, from 1990 to 2022, fugitive emissions from oil and natural gas systems increased by 286.8%. Emissions from solid fuels in fugitive sector were increased by 89.3% in the same period.

[123] NID, 2024

3.2.2 INDUSTRIAL PROCESSES AND PRODUCT USE

The GHG emissions from industrial processes and product use were released as a result of manufacturing processes. It means this category includes only emissions from processes and not from fuel combustion used to supply energy for carrying out the processes. For that reason, emissions from industrial processes are referred to as non-combustion.

The total GHG emissions from industrial processes and product use was 69.91 Mt CO2 eq. for the year 2022 which was 12.5% of the total emissions excluding LULUCF sector and 13.9% of all emissions including LULUCF in Türkiye. The most important GHG emission sources of IPPU in 2022 were cement production with 7.1%, iron and steel production 1.7% and Product Uses as Substitutes for ODS 1.7% shares of the total national GHG emissions excluding LULUCF. The main gas emitted by the IPPU sector in 2022 was CO2, contributing 82.8% reaching 57.91 Mt CO2 eq. of the sector emissions in 2022. HFCs, PFCs and SF6 contributed 15% reaching 10.4 Mt CO2 eq.[124]

Table 16 - Industrial processes and product use sector emissions, (kt CO2 eq.), 2022[125]

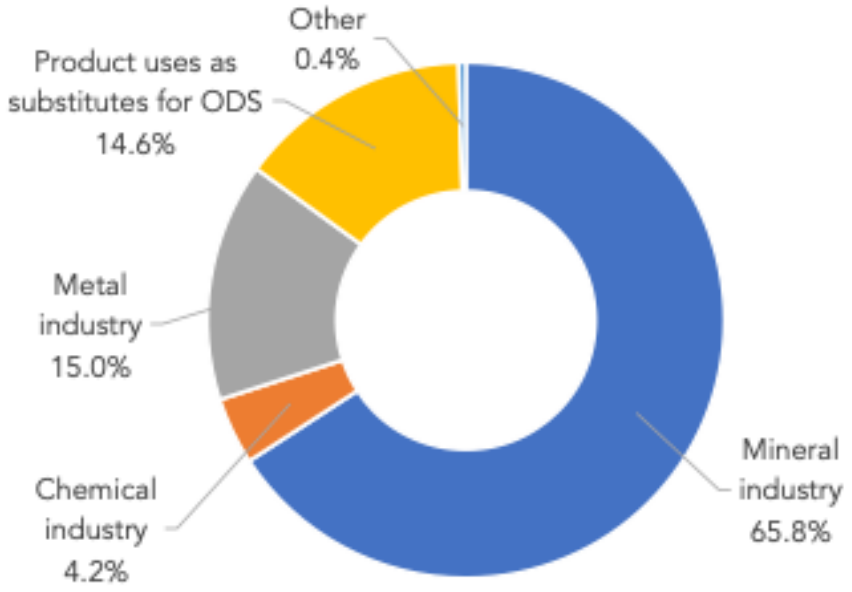
GHG sources and sink categories	CO2	CH4	N2O	HFCs/ PFCs/SF6	Total
Industrial processes and product use	57 911	17	1 580	10 400	69 908
Mineral industry	46 010	NA	NA	NA	46 010
Chemical industry	1 364	NO,IE,NA	1 580	NA	2 944
Metal industry	10 389	17	NA	52	10 458
Non-energy products from fuels and solvent use	148	NA,NE	NA,NE	NA	148
Electronic Industry	NA	NA	NA	71	71
Product uses as ODS substitutes	NA	NA	NA	10 184	10 184

[124] NID, 2024
[125] NID, 2024

Other product manufacture and use	NA	NA	NA	94	94
Other	NE,NA	NE,NA	NA	NA	NE,NA

The mineral industry contributed 65.8% of the IPPU sector's emissions, the metal industry contributed 15.0%, product uses as ODS substitutes contributed 14.6%, while the chemical industry contributed 4.2% in 2022.

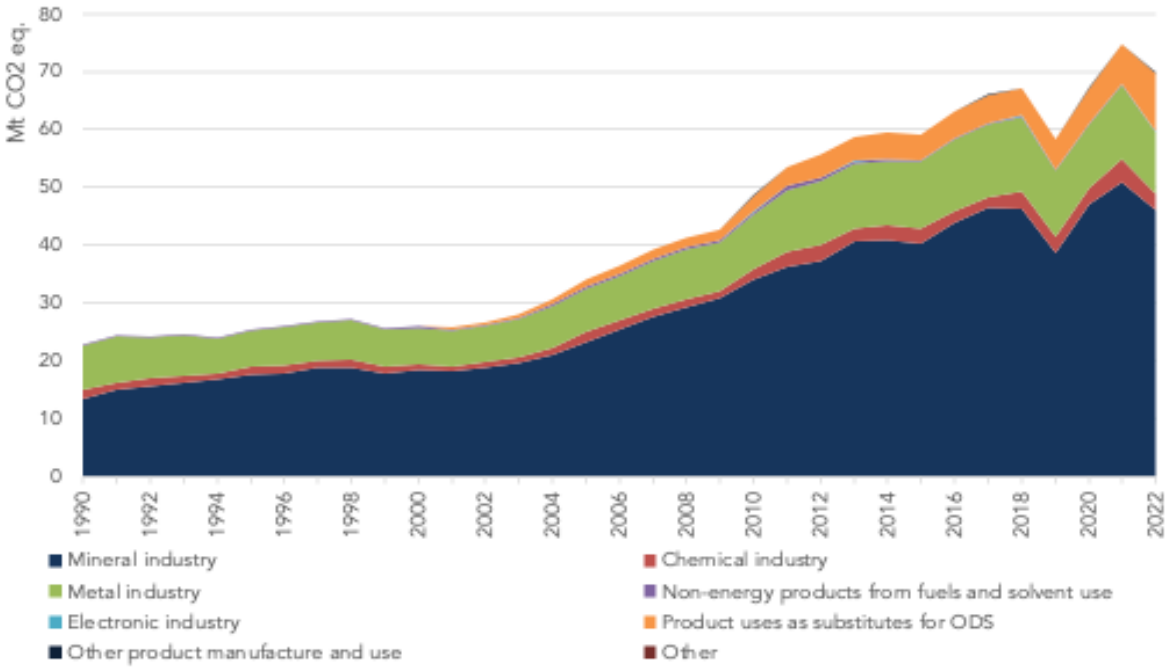
Figure 55 - Emissions from industrial processes and product use by subsector, 2022[126]



The increases in sectoral emissions observed over the longer term were principally due to growth in emissions associated with the mineral industry, predominantly cement production, and metal industry, primarily iron and steel production. The increases in emissions in these sectors were because of the industrial growth and the increased demand for construction materials. Each source category's contribution to total emissions and to sectoral trends within the IPPU sector between 1990 and 2022 is shown in below Figure 56.[127]

[126] Data source: CRT, 2022.
[127] NID, 2024

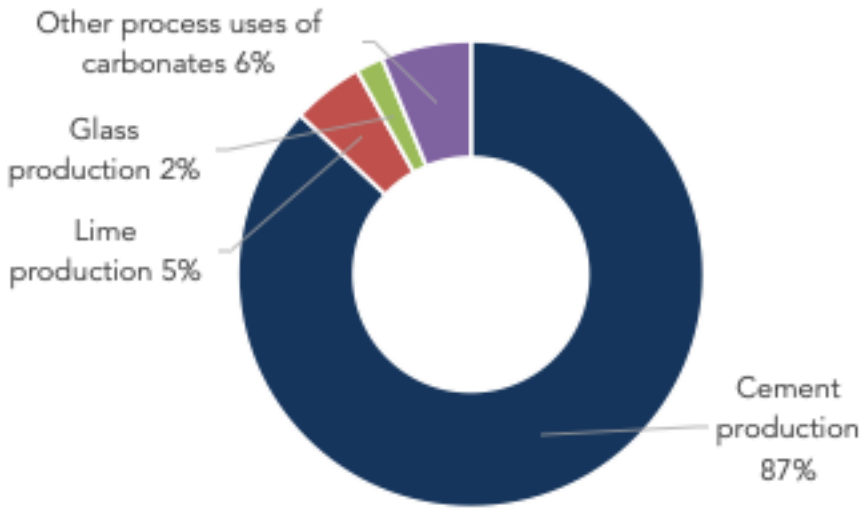
Figure 56 - Emissions from industrial processes and product use by subsector, 1990–2022[128]



Non-fuel CO2 emissions from cement and lime production and from limestone and dolomite use, glass production as well as emissions from ceramics production, soda ash use and non-metallurgical magnesia production were reported in mineral industry category. The vast majority of emissions in the metal industry were from iron and steel production, accounting for 92%. Figure 57 presents the share of CO2 emissions in this category for the year 2022. The dominant sector was cement production having a 87% share of CO2 emissions in the mineral industry. The second and third sectors were other process uses of carbonates, with a 6.2% share, and lime production, with a 4.9% share of CO_2 emissions. Glass production was responsible for 1.9% of emissions in the mineral industry.

[128] Data source: CRT, 2022.

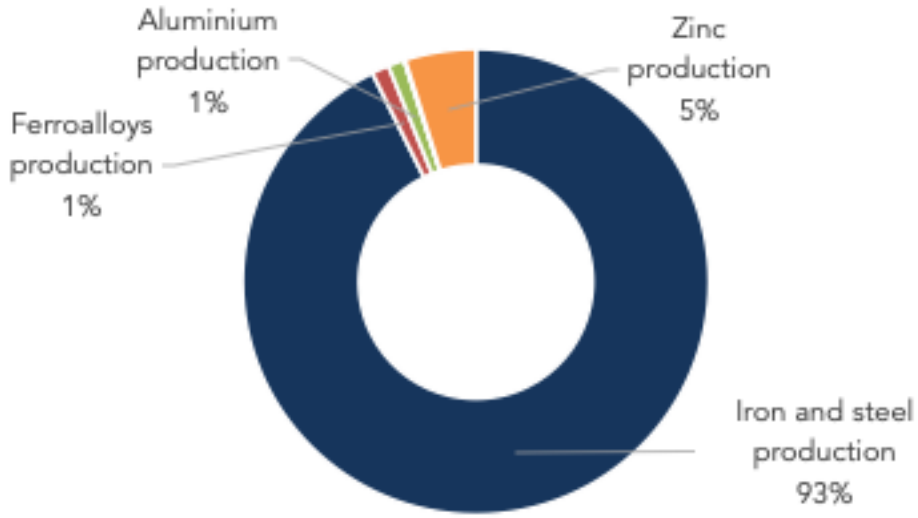
Figure 57 - Share of CO2 emissions from mineral production, 2022[129]



In 2022, the metal industry was responsible for 10.46 Mt CO2 eq., 15% of total emissions from the industrial processes and product use sector. Zinc production was responsible for 508.46 kt CO2 eq. contributed 4.9% of sector emissions Aluminum production was responsible for 125.5 kt CO2 eq., 1.2% of metal emissions, and ferroalloys production 124.85 kt CO2 eq., 1.2% of metal emissions. (see Figure 58)

[129] Data source: CRF, 2022.

Figure 58 - Emissions from metal industry, 2022[130]



Between 1990 and 2022, emissions from the metal industry rose by 38.1%, increasing from 7.6 Mt CO_2 eq. to 10.5 Mt CO_2 eq. This rise was largely driven by the iron and steel industry, which saw a 39% increase over the same period, growing from 6.9 Mt CO_2 eq. in 1990 to 9.6 Mt CO_2 eq. in 2022[131]

Finally, ammonia production and nitric acid production within the chemical sector contributed 701.41 kt CO_2 eq. and 1,580.39 kt CO_2 eq., respectively, accounting for 1% and 2.3% of the IPPU sector's emissions.

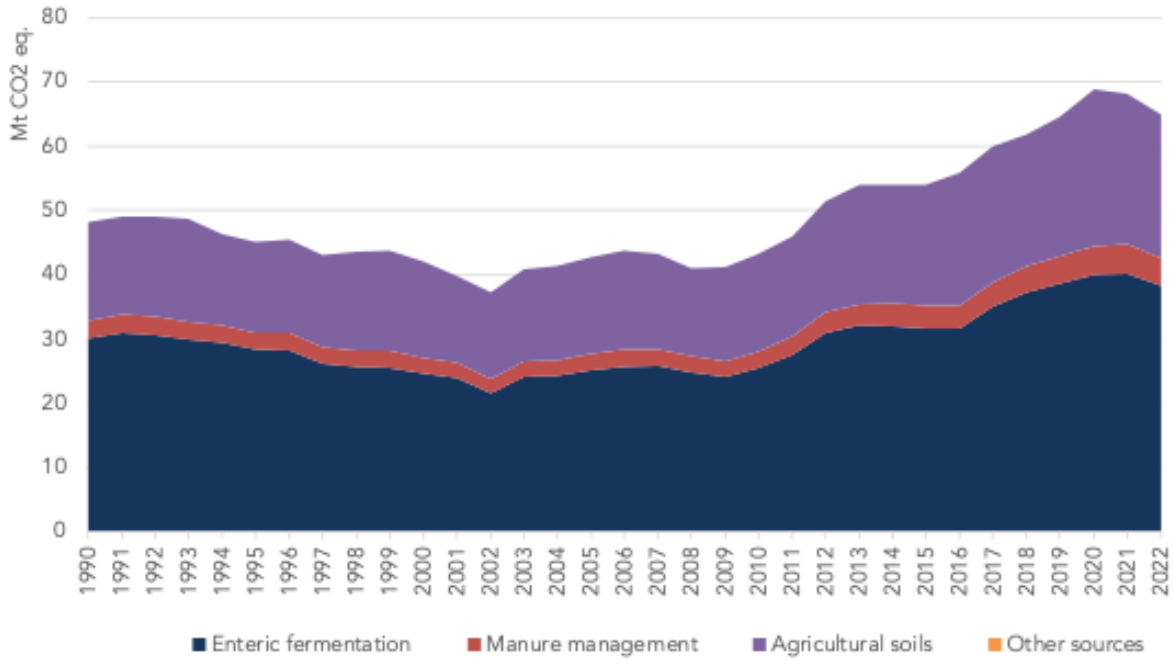
3.2.3 AGRICULTURE

The total emission value calculated for the agriculture sector was 71.5 Mt CO2 eq. for the year 2022 which was 14.2% of the total emission value including the LULUCF sector and 12.8% of all emissions excluding the LULUCF sector for Türkiye. The sector's overall emissions increased from approximately 51.8 Mt CO_2 eq. to 71.5 Mt CO_2 eq. over the 33-year period since 1990, marking a 38% increase. The biggest increase among the categories in absolute terms for the emissions is observed in the enteric fermentation category where the emissions increased by around 8.2 Mt CO2 eq. (27.5%) from 30 Mt CO2 eq. to 38.2 Mt CO2 eq. for the same period.[132]

[130] Data source: CRT, 2022.
[131] NID, 2024.
[132] NID, 2024.

Other significant increases in this thirty-three years period are seen in agricultural soils, manure management, and urea application where the figures are 6.9 Mt CO2 eq. (45%), 3.8 Mt CO2 eq. (69.4%), and 0.7 Mt CO2 eq. (147%), respectively. Emissions for rice cultivation increased by around 0.2 Mt CO2 eq. (149.7%) whereas the emissions for field burning of agricultural residues between 1990 and 2022 resulted in a decrease of 50.7%.

Figure 59 - Cumulative emissions of agricultural categories, 1990–2022[133]

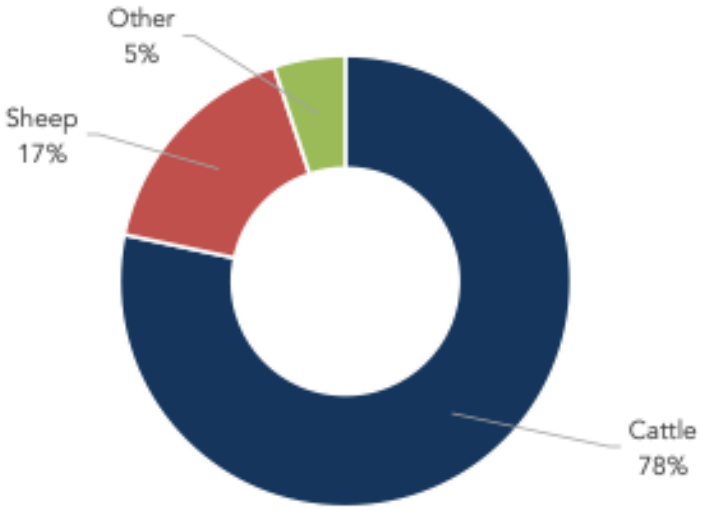


Furthermore, in relative terms, the biggest category in the agriculture sector is enteric fermentation having a 53.5% share for 2022, so it dominates the sector. In

[133] Data source: CRT, 2022.

all reported years, 1990-2022, this category had an average share of 54.6% in the agriculture sector, starting with a share of 57.9% in 1990.

Figure 60 - Enteric Fermentation Emission Sources, 2022[134]

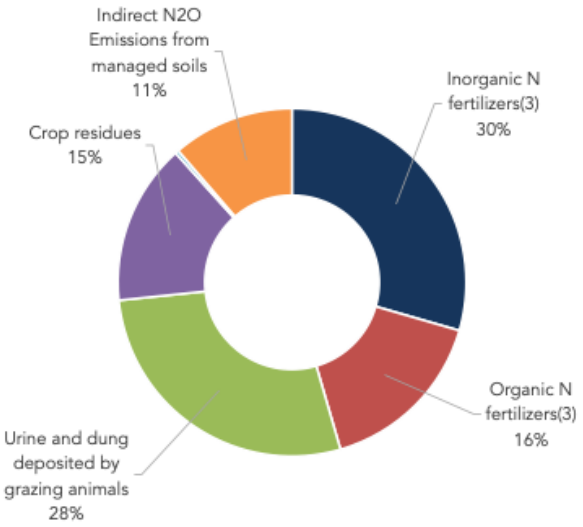


The second biggest category is agricultural soils having a proportion of 31.2% for 2022 increased from 31% in 2021. While having a percentage share of agricultural soils of 33% in 2002, its average share for the entire reporting period of thirty-three years is around 31.2%. Manure management's share presents somehow a more stable increasing trend, starting from 10.6% in 1990 and reaching 13.1% in 2022 while having an average of 11.9% for all reporting years. For 2022, remaining categories, which are rice cultivation, field burning of agricultural residuals, and urea application, had emission shares of 0.4%, 0.3%, and 1.6%, respectively. Though the share increased by around 81% for rice cultivation and 79.4% for urea application, the absolute terms were small and relative weights of these two categories were low for the reporting period, 1990-2022. Despite these increasing

[134] Data source: CRT, 2022.

share values, the share for field burning of agricultural residues decreased from 0.7% to 0.3% for the reporting period.

Figure 61 - Sub-categories of Agricultural Soils Emission Sources, 2022[135]



3.2.4 LAND USE LAND USE CHANGE AND FORESTRY

The LULUCF sector of Türkiye is a net removal dominated by forests. The 23 Mha of forest area removed a net 44.75 Mt of CO2 eq. from the atmosphere in 2022. Other land uses are net emissions while accounting equals to 5 percent of forest land removals. The total removals of the sector when HWP was added has been 58.6 Mt of CO2 eq.. The reason for the decrease in the trend for the last 4 years comparing 2018 was intense wood harvest policies due to salvage logging and to meet of demand of the growing wood industry of Türkiye and mega forest fires and other natural disturbances triggered by climate change. These natural disturbances also caused decreasing in annual increment values per hectare.

[135] Data source: CRT, 2022.

Figure 62 - The trend of LULUCF sector removals (Forest Land and HWP) 1990-2022[136]

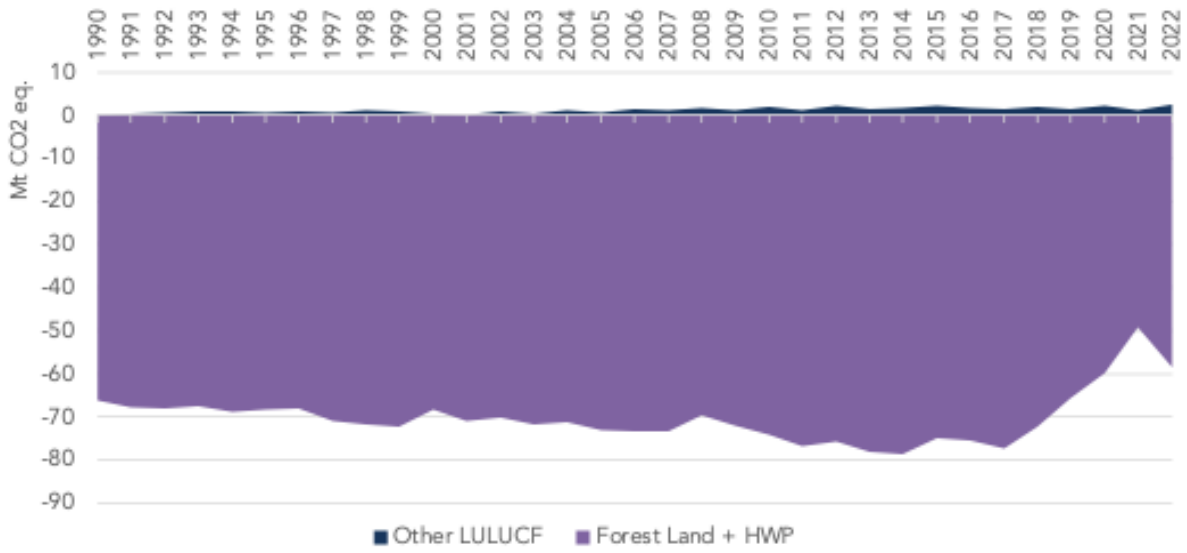


Table 17 - Total emissions and removals from the LULUCF sector by source (kt CO2 eq.)[137]

Year	Total	Forest land	Cropland	Grassland	Wetlands	Settlements	Other land	Harvested wood products
1990	-66 430	-63 482	IE,NE,NO	NA,NO	0	IE,NO	NO	-2 948
2000	-68 156	-64 183	65	94	-158	144	187	-4 305
2005	-72 222	-66 419	237	256	-427	271	310	-6 451
2010	-72 058	-65 691	530	630	-231	424	600	-8 321
2015	-72 857	-62 751	578	977	-644	419	764	-12 198
2020	-57 641	-47 924	585	645	-260	513	695	-11 895
2021	-47 875	-33 379	373	383	-519	478	533	-15 744
2022	-56 096	-44 755	574	628	-98	509	735	-13 689

[136] Data source: CRT, 2022.
[137] NID, 2024.

Figure 63 - Trend of total emissions from the LULUCF sector, 1990-2022[138]

LULUCF emissions or removals, in CO2 equivalent, were variable over the reporting period 1990-2022. Generally, decreases in removals were influenced by fires and drought in the relevant areas. Moreover, rises were originated mainly from forest management, afforestation, rehabilitation of degraded forests, reforestations on forest land, etc.

In 2022, total CO2 eq. removals of the LULUCF sector have increased by 17.4% compared to 2021. The main reasons for the rise in removals for LULUCF were improvements in sustainable forest management, afforestation, rehabilitation of degraded forests, reforestations on forest land and conversion of coppices to productive forests in forest land remaining forest land, efficient forest fire management and protection activities, conversions to perennial croplands from annual croplands and grasslands, and conversions to grasslands from annual croplands. The main reasons for the decrease in removals were related to drought and biomass burning as wildfire (e.g. the year 2008; 29 749 ha forest area burned), deforestation, conversions to wetlands (flooded land) and settlements.

3.2.5 WASTE

The waste sector includes GHG emissions from the treatment and disposal of wastes, open burning, wastewater treatment and discharge. Waste incineration emissions were included in the inventory however it was reported under the energy sector.

[138] Data source: CRT, 2022.

Total waste emissions for the year 2022 were 16.3 Mt CO2 eq., or 2.9% of total GHG emissions (without LULUCF). Within the sector, 65% of the emissions were from solid waste disposal, followed by 35% from wastewater treatment and discharge, 0.13% from biological treatment of solid waste and 0.07% from incineration or open burning of waste.

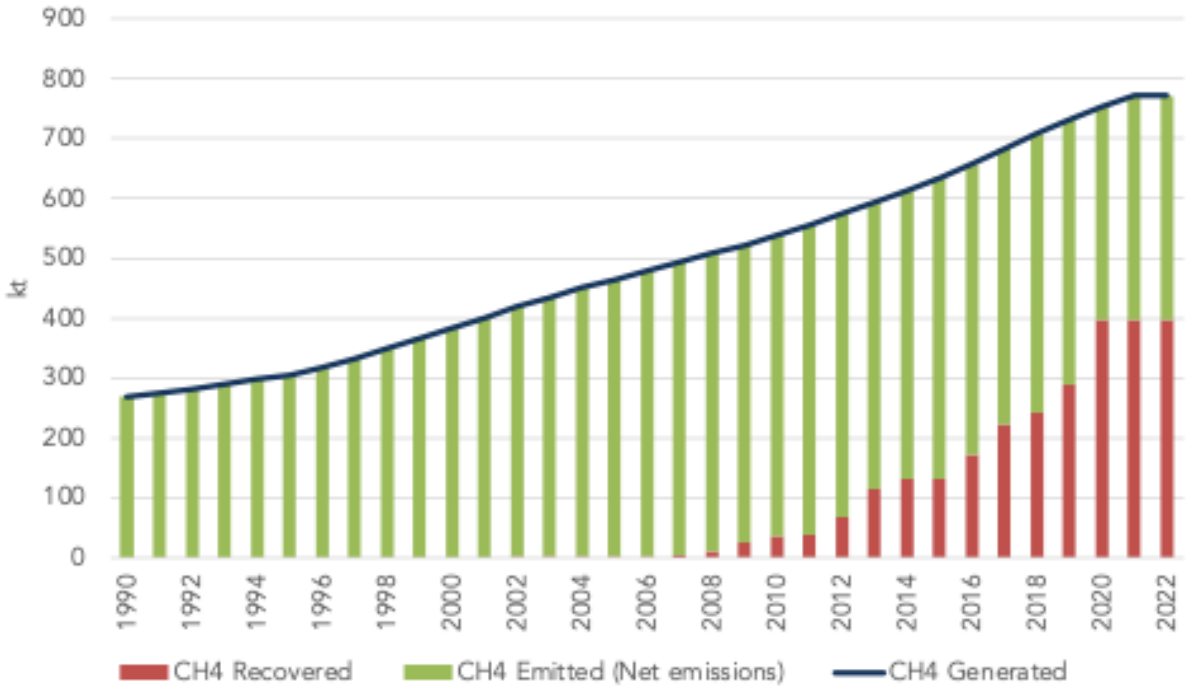
Table 18 - Total emissions from the waste sector by source (kt CO2 eq.)[139]

Year	Total	Solid waste disposal	Biological treatment of solid waste	Incineration and open burning of waste	Wastewater treatment and discharge
1990	10,316	5,788	13	110	4,405
1995	12,114	7,198	11	109	4,796
2000	14,537	9,590	13	93	4,841
2005	16,892	11,881	17	50	4,943
2010	18,078	13,080	21	39	4,937
2015	17,722	13,140	16	2	4,563
2020	16,976	11,642	16	8	5,311
2021	15,424	9,922	23	10	5,469
2022	16,265	10,613	20	12	5,620

Total emissions, in CO2 equivalent, increased by 58% from 1990 to 2022 and 5.5% from 2021 to 2022. The trend was mainly driven by solid waste disposal.

[139] NID, 2024.

Figure 64 - CH4 emissions from solid waste disposal, 1990-2022[140]



Net methane emissions tend to decrease with the increase in methane recovery amount due to the increase in the capacity and number of methane recovery facilities producing electricity/heat energy from landfill gas in Türkiye.

3.3 NATIONAL INVENTORY SYSTEM

3.3.1 INSTITUTIONAL, LEGAL AND PROCEDURAL ARRANGEMENTS

The Turkish national inventory system is featured by centralized governance. Ministry of Environment, Urbanization and Climate Change (MoEUCC) is the National Focal Point of the UNFCCC, and is responsible for climate change and air pollution policies and measures. Türkiye established the Coordination Board on Climate Change (CBCC) in 2001 with the Prime Ministerial Circular No. 2001/2 in order to determine the policies, measures and activities to be pursued by Türkiye on climate change. Under the chairmanship of MoEUCC, this board is composed of high level representatives (Undersecretary and President) from Ministries related to foreign relations, finance, economy, energy, transport, industry, agriculture, forestry, health, education, TurkStat, and Non-Governmental Organizations (NGOs) from business sector. The CBCC was restructured in 2013, and renamed as Coordination Board on Climate Change and Air Management

[140] Data source: NID, 2024.

(CBCCAM). The CBCCAM, a public body created by Prime Minister Circular 2013/11, is competent for taking decisions and measures related to climate change and air management. The CBCCAM decisions are the first legal means for the national inventory system.

Türkiye has also taken steps to strengthen its institutional arrangements. In 2021, Türkiye established a new Directorate of Climate Change (DoCC) under the MoEUCC with Presidential Decree No. 85 on Amending Certain Presidential Decrees. With the same decree, CBCCAM was replaced by the Coordination Board on Climate Change and Adaptation (CBCCA), and it was stated that climate change negotiations would be conducted by a Chief Negotiator (Relevant Deputy Minister). In addition, it was stated that the Secretariat services of the Coordination Board would be carried out by the CCO. The Coordination Board is responsible for determining, monitoring, and evaluating plans, policies, strategies, and actions related to climate change. The Coordination Board, which is an inter-ministerial coordination mechanism and chaired by the Minister, consists of twenty-two members, including TurkStat.

The draft directive on the working procedures and principles of the Coordination Board will be prepared by the DoCC, and within this scope, sub-working groups will be formed, the details of which will be determined in the directive. Since studies on this directive are still ongoing, current studies are carried out with seven working groups (WGs) within the scope of the CBCCAM:

- GHG Mitigation WG
- Climate Change Adverse Effects and Adaptation WG
- GHG Emission Inventory WG
- Finance WG
- Technology Development and Transfer WG
- Education, Capacity Building WG
- Air Management WG

The national GHG inventory is prepared under the auspices of the "GHG Emission Inventory Working Group" which was established in 2001 by the former CBCC. TurkStat was formally appointed as single national responsible authority to coordinate and implement national inventory activities from planning to management by Decision 2009/1 of the CBCC in 2009. TurkStat is also in charge

of annual inventory submission to the UNFCCC Secretariat and of responding to the ERT recommendations.

Also, the legal basis of the national inventory system is currently provided by the Statistics Law of Türkiye through the Official Statistics Programme (OSP). The OSP is based on the Statistics Law of Türkiye No. 5429 and Presidential Order No. 4, and was first prepared in 2007 for a 5-year-period and updated every 5 years. OSP identifies the basic principles and standards dealing with the production and dissemination of official statistics and produces reliable, timely, transparent and impartial data required at national and international level. For all kinds of official statistics, the responsible and related institutions are defined, data compilation methodology and the publication periodicity/schedule of official statistics are specified. TurkStat is the responsible institution for the compilation of the national GHG inventory through the OSP and coordinates the activities of the GHG emission inventory working group established in the scope of OSP with the same composition as the GHG emission inventory working group under the CBCCAM.

The GHG national inventory is compiled by GHG Emission Inventory working group under the coordination of TurkStat.

The institutions included in the working group are:

- Turkish Statistical Institute (TurkStat),
- Ministry of Energy and Natural Resources (MENR),
- Ministry of Transport and Infrastructure (MoTI),
- Ministry of Environment, Urbanization and Climate Change (MoEUCC),
- Ministry of Agriculture and Forestry (MoAF).

The national inventory arrangements are designed and operated to ensure the TACCC quality objectives and timeliness of the national GHG inventories. The quality requirements are fulfilled by implementing consistently inventory quality management procedures.

Responsibilities of the institutions involved in the national GHG inventory are shown in Table 19.

Table 19 - Institutions by Responsibilities for National GHG Inventory

Sector	CRT Category	Collection of Activity Data	Selection of Methodology and Emission Factors	GHG Emission Calculation	Filling in CRT tables and preparing NID	Quality control
Energy	1 - Energy (Except 1.A.1.a- public electricity and heat production and 1.A.3-Transport)	MENR, TurkStat	TurkStat	TurkStat	TurkStat	TurkStat
	1.A.1.a- Public electricity and heat production	MENR	MENR	MENR	MENR	MENR
	1.A.3- Transport	MoTI, TurkStat	MoTI	MoTI	MoTI	MoTI
Industrial Processes and Other Product Uses	2 - IPPU (except F-gases)	TurkStat	TurkStat	TurkStat	TurkStat	TurkStat
	F-Gases	MoEUCC	MoEUCC	MoEUCC	MoEUCC	MoEUCC
Agriculture	3 - Agriculture	TurkStat	TurkStat	TurkStat	TurkStat	TurkStat
Land Use, Land Use Change and Forestry	4 - LULUCF	MoAF	MoAF	MoAF	MoAF	MoAF
Waste	5 - Waste	TurkStat	TurkStat	TurkStat	TurkStat	TurkStat
Cross cutting issues						
Key Source Analysis			TurkStat			
Uncertainty analysis						

The national GHG inventory is subject to an official consideration and approval procedure before its submission to the UNFCCC. The national inventory is subject to a two-step official consideration and approval process. The final version of the NID and CRT is first approved by the TurkStat Presidency and published in the official TurkStat press release. The latest press release of Greenhouse Gas Emissions Statistics can be found on https://data.tuik.gov.tr/Bulten/Index?p=Greenhouse-Gas-Emissions-Statistics-1990-2021-49672 as scheduled on National Data Publishing Calendar. Subsequently, The MoEUCC as National Focal Point to the UNFCCC provides final checks and approval of the CRT via ETF web application tool as a final step prior to its submission to the UNFCCC.

TurkStat, as the Single National Entity, is responsible for official inventory submission to UNFCCC, and also responsible for responding to the UNFCCC expert review team (ERT) recommendations on national inventory improvement and ensuring they are incorporated in the current and following NID(s) in the broader context of its continuous improvement.

3.3.2 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) AND VERIFICATION

The inventory planning system of Türkiye is conducted in line with quality assurance and quality control (QA/QC) plan. Planning stage is under the responsibility of GHG Inventory WG. Planning activities include data collection and processing, selection of EF estimation methodology, compilation of CRT and NID, UNFCCC expert review team (ERT) recommendations, documentation and archiving, verification through time series consistency and cross checks, reporting and publication process.

Every year in the autumn, about October, WG meeting is organized to agree on a work plan and calendar for the following submission.

Information required for the inventory are mostly covered by OSP. Distribution of work for data gathering, processing and estimation of emissions are shown in Table 1.1. Emissions originating from energy, industrial processes and product use, agriculture and waste, and emissions and removals from LULUCF are calculated at national level annually by using recommended approaches in 2006 IPCC Guidelines. Fuel combustion emissions other than electricity generation and transport are calculated by TurkStat via using the energy balance tables of the Ministry of Energy and Natural Resources. Emissions from industrial processes (excluding F-gases), agriculture, waste and fugitive emissions from coal mining, oil and gas systems are also calculated by TurkStat. The emissions originating from

public electricity and heat production are calculated on the basis of plant level data by the Ministry of Energy and Natural Resources; the emissions originating from transportation are calculated by the Ministry of Transport and Infrastructure. The fluorinated gases are calculated by the Ministry of Environment, Urbanization and Climate Change. Emissions and removals from land use, land-use change and forestry are estimated by the Ministry of Agriculture and Forestry.

Every sector expert that performs the emission estimation is responsible for the data entry to ETF Reporting Tool, and preparation of the related section or sub-section of NID. TurkStat compiles and makes key source and uncertainty analysis and does final quality checks, and submits the national GHG inventory to the UNFCCC Secretariat.

TurkStat is also responsible for archiving the GHG inventory. Central archiving is carried out by TurkStat. EFs, AD, calculation sheets, CRT and NID outputs, etc. regarding the emission inventory are archived on TurkStat main server. All inventory related documents are also archived by the relevant Ministries for the CRT categories under their responsibilities.

QA/QC and verification procedures are an integral and indispensable part of the national GHG inventory of Türkiye. The quality of the national inventory system is ensured by the QA/QC system, through the QA/QC plan adopted by the CBCCAM decision in 2014 and revised and updated in 2017. The QA/QC plan introduces the structure and purpose of the QA/QC system, endorse the quality objectives. The main objective of the QA/QC plan is to ensure that the national GHG inventory is prepared in accordance with the quality objectives: transparency, accuracy, comparability, consistency, completeness (TACCC) as defined in UNFCCC reporting guidelines (18/CMA.1, Annex and 5/CMA.3). Türkiye also considers three additional quality objectives as improvement, sustainability and timeliness.

Improvement: Processes ensure that the inventory represents the best possible estimates of GHG emissions and removals for all categories, given the current state of scientific knowledge, data availability and national resources, taking into account information gained and lessons learned from reporting and review in the latest GHG inventory cycle.

Sustainability: Processes ensure the continuity of the GHG inventory system through institutional memory by establishing a documentation/archiving system and methodological manuals, as well as a training for newcomers and periodic refreshment trainings for existing inventory experts.

Timeliness: All of the QA/QC procedures are developed with a view to enabling the timely submission of the NID and the accompanying CRT to the UNFCCC by 15 April each year. In addition, inventory inputs, references and materials should be transparently documented and accessible, to enable timely responses to external requests for information, including formal and informal inventory review processes.

Together with verification, the implementation of QA/QC procedures are considered integral part of national inventory preparation and play a pivotal role not only to achieve the quality objectives but also for continuous reassessing and improving the national inventory where needed.

TurkStat is the designated body for overall implementation of the QA/QC system and for ensuring coordination of the QA/QC activities.

Quality Control (QC) is a system of routine technical activities to assess and maintain the quality of the inventory as it is being compiled. It is performed by personnel compiling the inventory. QC activities include general methods such as accuracy checks on data acquisition and calculations, and the use of approved standardised procedures for emission and removal calculations, measurements, estimating uncertainties, archiving information and reporting. QC activities also include technical reviews of categories, activity data, emission factors, other estimation parameters, and methods.

The data used in the preparation of the national GHG inventory for the IPPU, agriculture, and waste sectors are obtained from industrial production statistics, agricultural statistics, and waste statistics databases of TurkStat. TurkStat is producing all its statistics according to the European Statistics Code of Practice which covers a common quality framework with the European Statistical System. Therefore, high quality data are used in the inventory.

Detailed information about national inventory system is available in latest NID of Türkiye which was submitted to UNFCCC in 2024.

3.3.3 REPORTING UNDER ARTICLE 3, PARAGRAPHS 3 AND 4, OF THE KYOTO PROTOCOL

Türkiye, as a Party included in Annex I with No commitments inscribed in Annex B to the Kyoto Protocol, has no obligation to report on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

3.3.4 NATIONAL REGISTRY

Türkiye, as a Party included in Annex I with No commitments inscribed in Annex B to the Kyoto Protocol, has No obligation to report on the National Registry.

4 POLICIES AND MEASURES

This chapter elaborates Türkiye's policies and measures relevant to the reduction of greenhouse gas emissions and strengthening removals.

4.1 INSTITUTIONAL, LEGISLATIVE AND POLICY FRAMEWORKS AND MONITORING AND EVALUATION APPROACH

4.1.1 OVERVIEW

Türkiye became a party to **UNFCCC** on 24 May 2004, ratified the Kyoto Protocol on 26 August 2009, and ratified the **Paris Agreement** on 7 October 2021.[141] Türkiye, a candidate country of the European Union (EU), aims to ensure the **full harmonization of the EU Climate Acquis**. In 2021, Türkiye declared to reach a **net-zero emission target by 2053**. Within these frameworks, transformation in the institutional, legal, and policy setup has accelerated in several paths over the recent years. The following sections describe the recent changes and current status of legal, institutional, and policy frameworks of Türkiye and their impacts to contribute to the global efforts to fight against climate change.

4.1.2 POLICYMAKING AND INSTITUTIONAL FRAMEWORK

4.1.2.1 Institutional Framework

The Climate Change and Adaptation Coordination Board (CCACB), consisting of 26 member organizations is the main policy formulation entity streamlining climate policies.[142] The CCACB is structured to ensure a high degree of technical and political expertise in different sectors, as well as the widest possible representation of relevant institutions and stakeholders. Therefore, besides the relevant ministries, the CCACB includes representatives from public institutions, private sector and

[141] On 7 October 2021 the Paris Agreement was ratified by the Parliament with the Law No. 7335 and entered into force on 10 November 2021.

[142] The Board consists of senior level representatives from the following institutions: MoEUCC (coordinator), chief climate negotiator, Ministry of Foreign Affairs, Ministry of Energy and Natural Resources, Ministry of Treasury and Finance, Ministry of Interior, Ministry of National Education, Ministry of Health, Ministry of Industry and Technology, Ministry of Agriculture and Forestry, Ministry of Trade, Ministry of Transport and Infrastructure, Ministry of Culture and Tourism, Ministry of Family and Social Services, Ministry of Justice, Ministry of Labor and Social Security, Presidency of Strategy and Budget, Council of Higher Education, Directorate of Climate Change, Scientific and Technological Research Council of Türkiye, TurkStat, Turkish Directorate of Environment Agency, Union of Chambers and Commodity Exchange, Turkish Industry and Business Association, Independent Industrialists' and Businessmen's Association, and The Union of Municipalities of Türkiye.

NGOs such as Turkish Statistical Institute (TurkStat), Turkish Union of Chambers and Commodity Exchange (TOBB), Turkish Industry and Business Association (TÜSİAD). The CCACB has several Working Groups which meet at least twice a year, provide technical support to the Board, carry out the activities envisaged by Board Decisions and operate according to their working programmes.

The Directorate of Climate Change (DOCC) affiliated to **the Ministry of Environment, Urbanization and Climate Change (MoEUCC)** is the key administration on climate change.[143] The DOCC is the National Focal Point for the UNFCCC, Kyoto Protocol, Vienna Convention, Montreal Protocol and Paris Agreement. As such, the DOCC bears the responsibility for coordinating the preparatory work carried out by relevant ministries for the climate negotiations, coordinates the activities to develop Türkiye's policy in the field of climate change and protection of ozone layer and organize the CCACB. The DOCC also coordinates the drafting and adaptation of national policy documents such as **Nationally Determined Contribution (NDC)**, **Climate Change Mitigation Strategy and Action Plan (CCMSAP)[144]** and **Climate Change Adaptation Strategy and Action Plan (CCMSAP)[145]**. It coordinates the activities of the MoEUCC within the framework of Türkiye's obligations under international commitments, such as preparation of **National Communications** and **Biennial Transparency Reports**.[146]

Relevant ministries such as **the Ministry of Energy and Natural Resources (MENR), the MoEUCC, the Ministry of Transport and Infrastructure (MoTI), the Ministry of Industry and Technology (MoIT), the the Ministry of Agriculture and Forestry (MoAF), Ministry of Treasury and Finance (MoTF), the Ministry of Trade (MoT)** and other institutions develop initiatives and implement activities that supports the fight against climate change. Policies and measures that aim to reduce GHG emissions and increase resilience against climate change are developed within the framework of the decisions taken at the CCACB. **The Presidency of Strategy**

[143] With the recent Presidential Decree, the name of the Ministry of Environment and Urbanizatio n (MoEU) has been changed to the Ministry of Environment, Urbanization and Climate Change (MoEUCC). The Directorate of Climate Change (DOCC) affiliated to the Ministry has been establis hed. In addition, with the same Decree, CCACBM was restructured as the Climate Change and Adaptation Coordination Board (CCACB).

[144] DOCC, 2024_a

[145] DOCC, 2024_b

[146] At the DOCC, 45% of the staff, which consists of managers, experts, engineers, and other publ ic personnel, are women. In addition, six of eleven (one director, three deputy directors, and sev en heads of department) middle and senior managers of the Directorate are women. (2022 dat a)

and Budget is another key administration which coordinates the development of national policies and their connection to annual plans and investments. The **TurkStat** is the main responsible authority to coordinate and implement national GHG inventory activities, being also the National Focal Point for national inventory in charge to submit the final yearly document to the UNFCCC Secretariat. Relevant Ministries provide data to TurkStat to support the preparation of the national GHG emission inventories.

Municipalities are important administrations in combating climate change, since they are responsible for taking a wide range of decisions that could contribute to the successful achievement of the national targets. More specifically, municipalities are in the position to implement crucial actions on transport emissions, and waste management. They could also influence buildings sector emissions through urban planning.

4.1.2.2 Policy Making and Assessment of the Economic and Social Consequences of Response Measures

Climate change plays a crucial role in Türkiye's government planning, with its integration into a wide range of sectors. Türkiye regularly updates its climate-related PaMs, ensuring they align with the comprehensive cross-sectoral Development Plan. These Development Plans are central to sector-specific planning, where each relevant ministry independently schedules and implements its policies based on these plans. Consequently, Türkiye's climate-related PaMs are strategically aligned with both the Development Plan and the sectoral policies of various administrations, demonstrating a cohesive approach to weaving climate considerations into the national planning framework. This approach enables Türkiye to continuously identify and revise its PaMs and practices.

To assess the *environmental, economic, and social consequences of PaMs*, Türkiye has legislation for **regulatory impact assessments (RIAs)** and **strategic environmental assessments (SEAs).** These critical tools ensure that regulatory and non-regulatory proposals are developed with a clear understanding of their potential impacts. Türkiye mandated the preparation of RIAs by the By-law on the Principles and Procedures Governing Regulatory Impact Analysis, which was enacted to systematize the evaluation of potential effects of proposed regulations, including climate change-related ones. Presidential decree **Procedures and Principles for the Implementation of Regulatory Impact Analysis** was published in the Official Gazette on June 4, 2022, under issue number 31856, outlined the mandatory guidelines for conducting RIAs to evaluate the effects of

proposed regulations before their enactment, ensuring a systematic approach to legislative development. The RIA process in Türkiye involves a detailed analysis of the social, economic, and environmental costs, benefits, and risks associated with new regulations, and it requires regulatory proposals to be justified with clear evidence. This process, designed to enhance transparency and accountability, ensures that economic, societal, and legal system impacts are thoroughly considered before regulations are implemented. On the other hand, SEA focuses on integrating environmental considerations into the planning and programming processes, particularly concerning policies, plans, and programs that are likely to have significant environmental impacts. The SEA process in Türkiye, guided by the **By-law on Strategic Environmental Assessment**, published in the Official Gazette on April 8, 2017, under issue number 30032, aligns with the EU's directive. This assessment, crucial for environmental protection, helps predict the environmental consequences of certain strategic decisions, ensuring that significant environmental impacts are identified and addressed at the earliest decision-making stages.

Türkiye's policy making process helps the country to identify alternative PaMs to the ones that **lead to greater levels of anthropogenic GHG emissions,** or it clarifies why these PaMs are necessary.

Türkiye uses participatory approaches for the development of climate policy. The **Climate Council**, held in Konya between 21-25 February 2022, brought all relevant stakeholders together, including civil society, private sector, public institutions, international organizations, local administrations, and academia. The Council was organized with the main theme "**2053 net zero emission goal: Türkiye's green development revolution**" and with the aim of introducing Türkiye's new climate change vision and green transformation understanding in cooperation with stakeholders. The 217 decisions which were adopted with a participatory and transparent process by the Council will serve as a reference point for the political decisions that Türkiye will take concerning climate actions in the coming period. Thus, the outcomes of the Climate Council have been published as a guidance document for Türkiye to combating climate change.[147]

4.1.3 LEGISLATIVE FRAMEWORK

Türkiye's main legislation for the protection of the environment is the **Environment Law** (law no. 2872). The Law outlines Türkiye's environmental policy in general

[147] MoEUCC, 2023_c. Seven decisions were formed at the intersection of climate change and gender equality and aimed at women's leadership and empowerment in fighting climate change.

terms and it embraces the **"polluter pays"** principle. The process of establishing a **climate law** continues.[148]

Türkiye's current legislative framework on climate change is mainly led by international concerns regarding climate change, especially the UNFCCC process and Türkiye's accession process to the EU. In order to make progress in its path to join the EU, Türkiye is determined to align its national legislation, administrative and institutional set up with the current **EU Acquis** distributed into 35 Chapters. Among these, **Chapter 27** covers **Environment and Climate Change**. Legislations have been adopted on air quality protection, air pollution control, landfill, integrated waste management, wastewater, chemicals, noise management, environmental impact assessment (EIA), strategic environmental assessment (SEA), ozone depleting substances and Monitoring of GHG emissions. A detailed overview of the Sectoral legislative framework is provided in Section 4.2. under each sector. Türkiye aims to improve enforcement of these legislation.

4.1.4 MAIN POLICY DOCUMENTS

The **12th Development Plan[149],** adopted by the Grand National Assembly of Türkiye, is the main policy document of the country for the period between 2024 and 2028. The Plan was adopted on October 31, 2023 and sets out the national development policy with a multi-sectoral approach. The timeframe of the plan is for 5 years. The Plan envisages a stable and sustainable economic growth and raising the competitiveness and welfare of Türkiye.

The main policy documents that are dedicated only to Türkiye's Climate Change policies are the **Climate Change Mitigation Strategy and Action Plan 2024-2030**

[148] Preliminary studies for a Climate Law were finalized and submitted to the Grand National Asse mbly of Türkiye (GNAT) for drafting and negotiation of Law by the parameters in the law-making process. The findings of the preliminary studies were submitted as a draft Climate Law pr oposal. The draft text aims to establish the legal basis of the mitigation and adaptation targets, s et up a national emissions trading system, planning and implementation tools in line with the gre en growth and Net-Zero Target in tackling climate change, as well as to improve the legal basis for effective climate action in Türkiye.

[149] The plan was published in the Official Gazette dated November 1, 2023 and entered into forc e. (https://www.sbb.gov.tr/wp-content/uploads/2024/06/Twelfth-Development-Plan_2024-2028.pdf)

(CCMSAP)[150] and the **Climate Change Adaptation Strategy and Action Plan 2024-2030 (CCASAP)**[151].

Türkiye submitted its first **Nationally Determined Contribution (NDC)**[152] in 2022 and updated it in 2021[153]. The NDC included forecasts based on currently implemented and future policies.[154]

The **Green Deal Action Plan of Türkiye**[155] contains actions necessary for executing the green transformation of Türkiye's industry, and measures to adopt for harmonizing with the EU's Green Deal, especially in areas related to trade and industry. The Action Plan including a total of 32 objectives and 81 actions under 9 main headings covers carbon border adjustments, green and circular economy, green finance, clean, economic and secure energy supply, sustainable smart mobility, and sustainable agriculture, combating climate change, diplomacy, and European Green Deal information and awareness activities.

Türkiye National Energy Plan[156]**,** and the **2nd National Energy Efficiency Action Plan (2nd NEEAP)**[157] are two key documents in terms of energy policies which impact emissions in various sectors. In addition, there are several other national strategies and action plans which have an impact on national emissions. The policy documents listed above, and these other strategies/plans are presented in detail in Section 4.2.

4.1.5 KEY TARGETS

Türkiye's main targets related to decrease GHG emissions are below:

- Türkiye's first NDC suggests a reduction of 21% of its GHG emissions compared to the business-as-usual level by 2030.
- Türkiye's **updated First NDC raises the emissions reduction target to 41%** compared to the business-as-usual level **by 2030.**[158]
- Türkiye aims for **net-zero emissions by 2053**.

[150] DOCC, 2024_a.
[151] DOCC, 2024_b.
[152] 1st NDC of Türkiye, 2021. Republic of Türkiye. https://unfccc.int/documents/627743
[153] Updated 1st NDC of Türkiye, 2021. Republic of Türkiye. https://unfccc.int/documents/497990
[154] Türkiye initially submitted the same document as INDC in 2015
[155] Ministry of Trade, 2021.
[156] MENR, 2022.
[157] MENR, 2018.
[158] The NDC estimated that, in the absence of mitigation measures, Türkiye's GHG emissions will r each 1,175 Mt CO2 eq. by 2030; however, with the implementation of measures outlined in the N DC, emissions are anticipated to decrease to approximately 695 Mt CO2 eq.

- Moreover, **the updated NDC** aims **peak emissions by, at the latest, 2038**.

The **12th Development Plan**'s selected key policy targets related to climate change are presented below:

Table 20 – Climate Change Mitigation Related Key Targets of the 12th Development Plan[159]

Related Sector	Target	Baseline 2022	Target 2028
Energy	Installed Wind Power (MW)	11,396	18,000
	Installed Solar Power (MW)	9,425	30,000
	Amount of Electricity Generated from Domestic Sources (TWh)	190.4	270
	Electricity Storage Capacity (MW)	N/A	5,000
	Energy Efficiency (BTEP)	N/A	4,500
	Share of Natural Gas in Electricity Production (%)	22.90	15
	Share of Renewable Resources in Electricity Generation (%)	41.70	50
	Amount of Electricity Produced from Domestic Sources (TWh)	198	270
Transport	Urban Rail Systems Network Length (km, cumulative)	810	1,078
	Share of Railways in Land Passenger Transportation (%)	5.37	7.6
	The Share of Railways in Land Freight Transportation (%)	4.77	9.0
	Railway Line Efficiency (Passenger-Km+Ton-Km)/(Outline Length)	2.41	7.0
	Electrified Line (%)	48.00	72.0

[159] 12th Development Plan, 2023.

Waste	Recovery Rate of Waste within the Scope of Zero Waste Project (%)	30.00	42.5
	Proportion of Municipality Population Provided with Waste Management Services (%)	88.00	100
LULUCF	Ratio of Forest Areas to Country Area (%)	29.80	30.30

Türkiye also announced fundamental targets at the **Türkiye National Energy Plan[160].** According to the plan, by 2035, Türkiye will reach approximately:

- 52.9 GW of solar, 29.6 GW of wind of which 24.6 GW onshore and 5 GW offshore, 35.1 GW of hydroelectric and 5.1 GW geothermal and biomass installed power capacity,
- 7.2 GW of nuclear installed power capacity,
- 7.5 GW battery power storage and 5.0 GW electrolyzer capacity.

According to the plan, renewable energy sources, which had a 16.7% share in primary energy consumption in 2020, will increase to 23.7% in 2035. Energy intensity will be decreased by 35.3%. In 2030, with the additional 82,184 GWh of renewable energy generation, approximately 13.7 billion sm3 of natural gas consumption will be saved and 4.6 billion dollars will be saved as the monetary equivalent of this natural gas.

Türkiye updated its ***installed solar and wind power capacity*** target for ***2035*** to ***120 GW*** as a combined target.[161]

Türkiye's sectoral targets are also presented on in Section 4.2 under each sector.

4.1.6 MONITORING AND EVALUATION OF POLICIES AND MEASURES

Each Ministry overseeing respective policies and measures are responsible for monitoring and evaluation of the implementation status and GHG emission reduction impacts of those policies. However, as the National Focal Point for the UNFCCC, the MoEUCC gathers the information and coordinates the reporting of the progress through National Communications and Biennial Reports. The Turkish Statistical Institute (TurkStat) ensures the collection of GHG emission data as the UNFCCC Focal Point for National GHG Inventories.

[160] MENR, 2022.

[161] MENR, 2024_a.

Monitoring of the Development Plans are important processes which also contributes to the monitoring and evaluation of the achievement of Türkiye's climate policies. The realization information of the activities determined to achieve the policies and measures in the Development Plan is entered into the Presidential Plan Program Monitoring and Evaluation System (CPPIDS) system on a quarterly basis by the officers specified for each activity which are determined by each administration for activities. The results are monitored by the Presidency of Strategy and Budget (SBB) over the CPPIDS.

The National Energy Efficiency Action Plan Monitoring and Steering Board (NEEAP MSB)[162] was established by the Presidential Circular on December 7, 2019 within the scope of the National Energy Efficiency Action Plan. The Board is responsible to determine energy efficiency strategies at the national level, prepare action plans and programs, monitor implementation levels of the 1st and 2nd National Energy Efficiency Action Plan(s) and ensure coordination for effective implementation.

The Monitoring, Reporting and Verification (MRV) of GHG emissions system also contributes to monitoring, evaluation, and policy formulation.

The MoEUCC is developing a legislation and a new online system entitled E-YIDEP which the municipalities will upload their LCCAPs thus, the Ministry will be able to monitor LCCAPs.

4.2 POLICIES AND MEASURES AND THEIR EFFECTS

Türkiye's overall climate change policy is framed with several cross-cutting and sectoral policies, strategies and action plans that are based on the national legislation in relevant sectors. Below both cross-cutting and sectoral policies are given in detail.

[162] The Board consists the high level representatives from Presidency of Strategy and Budget, Presidency of The Republic of Türkiye Economic Policy Board, Ministry of Environment, Urbanization and Climate Change, Ministry of Energy and Natural Resources, Ministry of Treasury and Finance, Ministry of Interior, Ministry of Education, Ministry of Health, Ministry of Industry and Technology, Ministry of Agriculture and Forestry, Ministry of Transport and Infrastructure, Energy Market Regulatory Authority, Union of Municipalities of Türkiye and Union of Chambers and Commodity Exchanges of Türkiye.

4.2.1 CROSS-CUTTING POLICIES AND MEASURES

Overview

The **12th Development Plan (2024-2028)**, adopted by the Grand National Assembly of Türkiye (GNAT) on October 31, 2023, was published in the Official Gazette dated November 1, 2023 and entered into force. The Plan is a national policy with a multi-sectoral approach. The plan was approved by the GNAT's Decision 1396/2023 and sets the country's vision for stronger, sustainable socioeconomic development. Development Plans are prepared by the Presidency of Strategy and Budget (SBB) with the active participation of all institutions and organizations and adopted by the GNAT. The Annual Presidential Programs define which administrations will carry out the policies and measures determined in the Development Plans through which activities in the relevant year. Public administrations prepare their budgets in accordance with the development plan, medium-term program, annual presidential program, strategic plans, and performance programs. The 12th Development plan sets several policies, measures (see following sections on sectoral policies) and target regarding the climate actions (see Section 4.1.5.). Moreover, Türkiye is also drafted a long-term low emission development strategy (Long-Term Strategy), however, it is not yet published.

The vision of the 12th Development Plan is "A stable, strong and prosperous Türkiye, that is ecofriendly, resilient to disasters, produces high added-value based on advanced technology, and shares income fairly in the Century of Türkiye."

In 2024, Türkiye adopted two pivotal strategies that will shape its approach to climate change mitigation and adaptation until 2030: the **2024-2030 Climate Change Mitigation Strategy and Action Plan[163] (CCMSAP)** and the **2024-2030 Climate Change Adaptation Strategy and Action Plan (CCASAP)**[164]. Under the CCMSAP, Türkiye conducted a thorough needs analysis to evaluate existing climate change policies, strategies, plans, and mitigation measures aimed at reducing greenhouse gas (GHG) emissions. Through inclusive stakeholder participation, sector-specific mitigation strategies and actions have been

[163] DOCC, 2024_a.
[164] DOCC, 2024_b.

formulated. The plan encompasses ***49 strategies and 260 actions***, focusing on key sectors such as industry, energy, buildings, transportation, agriculture, waste, and Land Use, Land Use Change, and Forestry (LULUCF), alongside considerations for just transition and carbon pricing. Simultaneously, the CCASAP focuses on assessing anticipated climate risks using Türkiye-specific climate change projections. Vulnerability and risk assessments have been conducted at a national scale across various sectors. In response, ***40 strategies and 129 actions*** have been identified to address climate risks pertaining to agriculture and food security, biodiversity, water resources management, tourism, cultural heritage, industry, urban areas, social development, public health, transportation, communication, energy, disaster risk reduction, and cross-cutting issues.

The "**Green Deal Action Plan**" of Türkiye has been published on 16th July 2021 with the Presidential Circular numbered 2021/15. The Action Plan including a total of 32 objectives and 81 actions under 9 main headings dwells on green transformation of Türkiye's industries and adoption of measures for harmonizing with the EU's Green Deal, especially in areas related to trade and industry. For the effective implementation of the Action Plan, on a technical level, twenty "Specialized Working Groups" have been established in sectors such as textile, construction, cement, aluminum and steel, as well as horizontal areas such as energy, finance and technology. The Action Plan identifies the relevant institutions and stakeholders that will work in cooperation with the main coordinating institution responsible for the realization of the actions and the timeline in which the works related to the actions will be carried out.

Table 21 contains Türkiye's cross-cutting policies and measures for reducing the Country's greenhouse gas emissions. Following the table, each policy/measure is described in the following subsections.

Table 21 – Cross-cutting policies and measures

PaM	Sector(s) affected	GHG(s) affected	Objective and/or activity affected	Type of instrument	Status	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact *(not cumulative, in kt CO2 eq.)* ***2030***
1 - Establishment of an Emissions Trading System	Cross-cutting	CO2, N2O, PFCs	Reducing GHG emissions of high emitting installations which has high GHG emissions	Regulatory, Economic	Planned	2025	MoEUCC	NE
2 - Monitoring, Reporting and Verification (MRV) of Greenhouse Gas Emissions of High GHG Emitting Installments	Cross-cutting	CO2, N2O, PFCs	Increasing the knowledge and data on Türkiye's GHG emissions	Information	Implemented	2014	MoEUCC	NE
3 - Establishment of National Crediting Mechanism	Cross-cutting	CO2, N2O, CH4	Increasing financial support to low-carbon development projects	Voluntary	Planned	2026	MoEUCC	NE
4 - Eco-Design and Energy Labelling and Environmental Labelling	Cross-cutting	CO2	Increasing energy efficiency of products which use electric energy	Regulatory	Implemented	2010	MoIT	NE
5 - Promotion of Local Climate Change Action Plans	Cross-cutting	CO2, N2O, CH4	Increasing local climate action of municipalities	Voluntary / Regulatory	Implemented / Planned	2018	MoEUCC /Municipalities	NE

6 - Promotion of Sustainability Reporting	Cross-cutting	All types of GHG	-	Regulatory	Implemented	2024	POA	NE
7 – Introduction of a Türkiye Green Taxonomy	Cross-cutting	All GHG		Voluntary / Regulatory	Planned		DOCC	NE
8 - Green Asset Ratio	Cross-cutting	All GHG	To measure the contribution of banks to the green transformation process (primary objective), To reduce greenwashing activities, To create a suitable ground for the flow of green funds to Türkiye.	Regulatory / Financial	Draft	2025	BRSA / Banks	NE

4.2.1.1 Establishment of an Emissions Trading System (ETS)

Türkiye aims to work on identifying critical sectors for the carbon markets and identifying their GHG reduction potential in the relevant sectors since the first NCCAP. The Climate Council (2022) included the Carbon Pricing and Green Finance commission. The suggestion by the Council was the **establishment of an Emissions Trading System (ETS)** that is consistent with Türkiye's national circumstances. The draft Climate Law, which will be the legal basis to introduce the ETS, has been prepared and shared with the members of the **CCACB** for their feedback. It is targeted in the 12th Development Plan (2024-2028) that legislation and other infrastructure preparations for the establishment of the ETS will be finalized and the system will be put into practice.

Economic Diversification

The ETS is a market-based approach used to control GHG emissions by providing economic incentives for reducing emissions. An ETS contributes to emission mitigation by setting a cap for a specific scope of sectors so by expanding the scope of ETS, cost-effective emission mitigation can be achieved across the jurisdiction level. By putting a price on carbon, an ETS incentivizes companies to invest in low-carbon technologies and renewable energy sources.

In addition, the carbon price set within an ETS sends signals to businesses and consumers about the cost of carbon emissions. This drives capital away from high-emission industries towards cleaner alternatives, fostering innovation and technological advancement in green sectors.

Box 1 - The history of ETS in Türkiye

The history of ETS preparations in Türkiye dates back to 2014 in terms of concreate actions. It can be stated that with the Partnership for Market Readiness, which has been worked in partnership with the World Bank, capacity has been created in many different topics. The studies carried out within the scope of the 1st Implementation phase (2013-2018) of the Partnership were as follows: Pilot studies of a reliable and robust monitoring, reporting and verification (MRV) system on which the ETS will operate are among the first outputs. The MRV system, which continues its activities by detailing on pilot studies, has been a system where emissions of emission-intensive sectors are monitored since 2015. Currently, almost half of the country's emissions are monitored by the MRV system via monitored around 780 facilities. Some of the analyzes carried out within the scope of PMR include, market-based emission reduction policy options evaluation for Türkiye, the analysis of the economic, fiscal and sectoral impacts of a carbon pricing policy and sectoral assessment study of the carbon leakage risk, which is another issue to be considered in the allocation process in carbon pricing policies.

The main works carried out within the scope of the 2nd Implementation phase of the PMR (2019-2021) were as follows: draft legislation studies regarding the sub-processes of the ETS have been put forward. A preliminary study has been carried out on the determination of a cap for the ETS and the development of the national allocation plan. Besides, a pilot ETS simulation was created as a gamification application and used with relevant stakeholders. Finally, a basic software was developed for the ETS registry model.

Following the studies under PMR, Türkiye has continued the preparations for the ETS under WorldBank's successor programme Partnership for Market Implementation (PMI). In that regard, Türkiye Carbon Market Development Project has become effective as of January 2024 and will last by the end of 2028. The Project will focus on the technical and institutional preparations towards the national ETS.

4.2.1.2 Monitoring, Reporting and Verification of GHG emissions

The **By-Law on Monitoring of Greenhouse Gas Emissions**[165] has been promulgated on Official Gazette No. 29003 on 17 May 2014 and came into force in order to regulate the principles and procedures for monitoring, verifying and reporting of greenhouse gas emissions arising out of the activities listed in Annex-1 of the legislation. According to the By-Law, manufacturing sector representatives of energy-intensive sectors such as electricity and steam production, petrol refineries, petrochemistry, cement, iron-steel, aluminum, brick, ceramic, lime, paper and glass production regularly report and verify their annual GHG emissions.

Implementation of the legislation regarding monitoring, reporting and verification (MRV) of GHG emissions has accelerated over the recent years. Monitoring plans have been received from the installations that are subject to the legislation. Preparation of monitoring plan, GHG emission report and its verification is ongoing. In order to facilitate the implementation of the legislation in an effective way, Data Management system (DMS) has been developed where installations can prepare/submit their monitoring plans and emission reports online. In addition to the monitoring guideline, reporting guideline, sectoral examples and uncertainty guideline, four technical guideline documents (Uncertainty Assessment, Biomass Sampling and Analysis, Data Flow Activities) have been prepared within the scope of studies to improve the application by examining the application methods and details that can provide improvement in data quality and in line with the needs of the sector. Also, training courses have been organized in order to develop capacities for accredited verifiers and certified verification companies.

The By-Law and the two Communiques under the framework of the By-Law have been developed as a part of efforts to align with the Decision No 280/2004/EC of the European Parliament and of the Council of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol.[166] Communique on Monitoring and Reporting

[165] This By-law has been amended two times since then. Firstly, By-law Amending the By-law on Monitoring Greenhouse Gas Emissions was published in the Official Gazette No. 29757 of 29 June 2016 and the second amendment was published in the Official Gazette No. 30082 of 31 May 2017.

[166] The pieces of legislation were enacted in parallel with Commission Regulations (EU) No. 601/2012 (Monitoring& Reporting) and No. 600/2012 (Verification& Accreditation) and also Regulations No 2067/2018, 2066/2018 within the scope of the Directive 2003/87/EC of the European Parliam

Greenhouse Gases was published on Official Gazette No 29068 on 22 July 2014. Communiqué Amending the Communiqué on Monitoring and Reporting of Greenhouse Gas Emissions was published in the Official Gazette No. 31386 of 5 February 2021. The legal document aimed at providing the principles and procedures for monitoring and reporting the greenhouse gas emissions originating from the activities listed in Annex 1 of the By-Law on Monitoring Greenhouse Gas Emissions. Communique on Verification of Greenhouse Gas Emission Reports and Authorization of Verification Institutions has been published on Official Gazette No 29314 on 2 April 2015. This Communiqué was repealed by the Communiqué on Verification of Greenhouse Gas Emission Reports and Accreditation of Verification Bodies which was published in the Official Gazette No. 30258 of 2 December 2017. Communiqué Amending the Communiqué on Verification of Greenhouse Gas Emission Reports and Accreditation of Verification Bodies was published in the Official Gazette No. 31873 of 21 June 2022. The legislation came into force in order to determine the principles and procedures regarding the features of verification institutions that will carry out these verification processes. The verification system established within the scope of the By-Law provide for verification control of emission reports prepared on a facility basis by on-site inspection of independent institutions before submitting to the Ministry. Production of transparent, accurate, comparable, complete and consistent data and information regarding greenhouse gas emissions on a facility basis are provided through implementation of these regulations and communiques.

Co-Benefits

Monitoring, Reporting, and Verification (MRV) of greenhouse gas (GHG) emissions offer several co-benefits beyond simply tracking and managing emissions.

The design, development, and implementation of MRV systems require expertise in environmental science, engineering, and technology. This creates demand for consulting firms, engineers, and specialists who can help organizations set up and manage their MRV systems. Also, developing and maintaining MRV software and technology platforms generates jobs in IT and software development.

Regular monitoring of emissions requires technicians and field staff to collect data, maintain equipment, and ensure accurate measurement. Professionals are needed to analyze emissions data, generate reports, and interpret results.

ent and of the Council establishing a scheme for greenhouse gas emission allowance trading wit hin the Community and amending Council Directive 96/61/EC (EU ETS Directive).

Independent third-party verification of emissions data requires certified auditors and verifiers, creating specialized job opportunities in this sector. Institutions that provide certification services for emissions reductions or sustainability claims need personnel for administration, assessment, and certification processes. Educators and trainers are needed to educate staff on MRV practices, compliance requirements, and sustainability standards.

Various industries, such as manufacturing, energy, and transportation, require MRV systems tailored to their specific needs, creating sector-specific job opportunities related to emissions management and reduction.

Regular MRV ensures enhanced accuracy in emissions reporting, which helps companies comply with environmental regulations and standards, thereby avoiding potential legal issues. Additionally, it fosters transparency, building trust with stakeholders such as regulators, investors, and the public.

It contributes decision-making process by the collection of data which supports the development of effective climate policies and strategies. Also it helps organizations make informed decisions about investments in new technologies, energy efficiency measures, and other sustainability initiatives.

4.2.1.3 Voluntary Carbon Market and National Crediting Mechanism

Türkiye has been working on the **voluntary carbon market** and following up the negotiations in **Article 6 of the Paris Agreement**. In this context, a study called **"State of the Voluntary Carbon Market in Türkiye and implications of engaging with Article 6 of the Paris Agreement"** was conducted in 2022 with the aim of making an inventory of the current projects in the voluntary carbon market that are hosted by Türkiye and analyze various scenarios for participating Article 6 of the Paris Agreement. Taking into account the requirements of authorization and corresponding adjustment under the Article 6 market-based mechanisms, Türkiye will constitute a strategic analysis with its NDC on the decision to participate in Article 6, and will construct several roadmaps considering its national priorities. Also technical work for establishing a national carbon crediting system in Türkiye began on May 12, 2023, with a protocol signed between the Directorate of Climate Change of Türkiye and the Turkish Standards Institution (TSI). In this context, this protocol aims to establish national standards and methodologies for emission reduction/removal projects. It will involve the registration of carbon crediting projects in accordance with these standards/methodologies, as well as

efforts to certify carbon credits. Implementation is expected to be operational in 2026.

Türkiye is one of the leading countries in terms of the number of registered projects in the voluntary carbon market. If the planned ETS in Türkiye allows for the use of offsets, it could create a demand for credits from these projects. Offsets can play a significant role in achieving emissions reduction goals by encouraging investment in diverse and innovative projects, often in regions or sectors not directly covered by the ETS.

Offsets can be crucial for meeting emissions reduction targets by promoting investment in a wide range of innovative projects, frequently in areas or sectors that are not directly included in the ETS. Similar to ETS, regulating activities in voluntary carbon markets entail an MRV system, validation and verification process, and digital registry infrastructure system, stimulating additional job opportunities in the jurisdiction.

Under the voluntary carbon market, various project types such as renewable energy, waste management, agriculture, transportation, and forestry may be included. Increasing the demand for credits obtained through offsets encourages the development of these types of projects. Implementing these projects can enhance air quality, ensure energy and food security, and support the protection of biodiversity and the environment.

Economic Diversification

The voluntary carbon market contributes to economic diversification in several ways. The creation of carbon credits through various projects opens up new business opportunities across different sectors. For businesses and governments, participating in the carbon market can diversify income sources by generating revenue from carbon credits. This can be particularly beneficial for sectors that are otherwise reliant on a single or few revenue streams. Projects in the voluntary carbon market often involve local communities, especially in developing regions. These projects can provide additional revenue streams and economic benefits to local areas through activities such as reforestation, sustainable agriculture, or renewable energy installations.

4.2.1.4 Ecodesign and Energy Labelling and Environmental Labelling

Türkiye adopted the **By-law on Environmentally Responsible Design of Energy-Related Products** in 2022 fully harmonized with the EU eco-design acquis

(2009/125/EC).[167] Ministry of Industry and Technology. Moreover, **the By-law on Framework For Energy Labelling** fully harmonized in parallel to the EU Regulation (2017/1369/EU). The Ministry published communiques on energy labelling and eco-design requirements for several energy related products.

Moreover, the **By-law on Environmental Labelling** entered into force in line with Regulation (EC) No 66/2010 of the European Parliament and of the Council on ecolabelling.[168] The By-law regulated environmental label specifications for seven products and service items, including glass, hand washing dish detergents, personal care and cosmetics, ceramic coating, textile, cleaning paper product groups, and tourist accommodation service group.

Lastly, the Eco-design for Sustainable Products Regulation, No. EU 2024/1781, which was published in the Official Journal of the European Union on 28.06.2024, is a key component of the European Green Deal and repeals Directive 2009/125/EC. Its objective is to minimize the environmental impacts of products throughout their life cycles by implementing design solutions aligned with the sustainable design approach. The harmonization of this regulation commenced simultaneously with the EU and is currently being executed.

Detailed list of implementing communiques on eco-design and energy labelling is in the Annex I - Türkiye's Eco-design, Eco-label and Automotive legislation.

4.2.1.5 Local Climate Actions

On the local level, various local authorities implement policies and measures in order to reduce GHG emissions, increase resource efficiency, increase resilience to climate change impacts and increase public awareness on climate change. **11th Development Plan** required preparation of climate action plans for seven geographical regions of Türkiye specifically focusing on adaptation measures. These regional climate actions, mainly focused on adaptation measures, were prepared.

The MoEUCC has set the target of **preparing local climate change action plans (LCCAPs)** in **all 30 metropolitan municipalities of Türkiye** within the scope of the 2019-2023 Strategic Plan of the Ministry. For this purpose, the Ministry has been supporting local authorities with various methods such as training programs,

[167] Official Gazette dated 5 February 2022 and numbered 31741. Previously, Türkiye adopted the By-law on Environmentally Responsible Design of Energy-
Related Products in 2010 harmonizing previous versions of the EU directives on the issue.
[168] Official Gazette dated 19 October 2018 and numbered 30570.

technical guidelines, and grant programs in order to spread these action plans. EU funded IklimIN Project Grant Programme (2017-2020), Climate Change Adaptation Project Grant Programme (2020-2025) and a nationally funded TÜBİTAK-MAM Project (2022) have been implemented to support local climate action. Several LCCAPs were prepared under these projects. **The Climate Council (2022)** resolute on 25 decisions on local climate action and 5 of those have been prioritized. These decisions include development of guidelines and tools to support preparation of LCCAPs.

A **draft by-law on the preparation of local climate change action plans (LCCAPs)** have been developed by the MoEUCC. This draft by-law aims to increase the number of LCCAPs prepared and implemented by local authorities. These plans will cover provincial administrative borders and include mitigation and adaptation actions together. Local authorities will be required to monitor, evaluate and update their plans.

Integrated Urban Development Strategy and Action Plan (2010-2023) (KENTGES) was adopted in 2010 for the period of 2010-2023. KENTGES is a cross cutting strategy document in terms of low carbon and sustainable development. Plan mentions studies and actions to be performed at central and local levels regarding transport, housing and land supply, disasters, natural and cultural assets, climate change, life quality, social policies and participation. In the Plan, the main principles and values regarding climate change and sustainable development are:

- Paying attention to ecological balance in natural resource use;
- Ensuring healthy, safe, and quality environment, free from natural and technological disasters and risks;
- Improving use of a sustainable transportation systems as well as use of renewable energy resources;
- Paying attention to environmental, natural and ecological equality;
- Encouraging methods to decrease impacts of consumption patterns on natural and cultural environment in settlements.

The **National Smart Cities Strategy and Action Plan (2020-2023)** is prepared at the national level, shaped by common sense and scientific perspective, including public institutions and organizations, local administrations, private sector, NGOs and universities. The Plan was published by a Presidential Circular and entered into force. It is aimed to implement smart city technologies and solutions to apply and disseminate on a regional and global scale. Local Smart City Strategy and Roadmap Guide, Smart Cities and Connected Data Guide, New Urban Agenda

and Smart Cities Guide documents have been prepared. Monitoring and evaluation studies regarding of the Plan were carried out.[169]

National Strategy of Regional Development (NSRD) determines the national priorities in regional development policies and functions as a blueprint for the regional development plans of 26 regional development agencies (DAs), action plans of regional administrations, other national and regional development strategies, the public investment and budgeting process, and specific territorial development programs. The new NSRD (2024-2028) is in the preparation phase and its vision is "With its globally competitive, prosperous and resilient regions and by using its local dynamics completely developed Türkiye" The elaboration process of the new NSRD involves input, consultation, and negotiation with various stakeholders, including the public and private sectors, NGOs, universities, development agencies (DAs), and local entities. NSRD is intended to serve as the primary coordination document for regional development policies and to be the second comprehensive strategy document focused on addressing regional development disparities and enhancing regional competitiveness in Türkiye. Within the scope of the new NSRD, nine themes have been determined: urban development, rural development, social policies, industry-logistics-transportation, green growth, R&D and innovation, entrepreneurship, digitalization and tourism. Strategies have been developed for the 2024-2028 period under these themes. After undergoing technical evaluations, the strategy will be approved by the Presidency of the Republic of Türkiye.

Regional development plans were primarily drafted and approved between 2009 and 2010 for the period of 2010-2013 for all regions. The second generation of regional development plans (2014-2023) was approved and became operational in 2014. The development of the third generation of regional plans is still underway and it is expected that they will be approved and operationalized in the latter half of 2023. In line with the NSRD, one of the priority areas of regional development plans is green growth and it is aimed to tailor climate change and green growth policies according to regions' needs and priorities.

4.2.1.6 Promotion of Sustainability Reporting

Public Oversight Authority sets and issues accounting, auditing and related professional practice standards to strengthen the reliability of financial statements and audits of the financial statements for investors and other related parties. Registration with the POA is a fundamental requirement for the auditors and audit

[169] MoEU, 2019

firms. An audit shall be carried out only by auditors or audit firms authorized by the POA. In December 2023, Public Oversight Authority (POA) published ***Turkish Sustainability Reporting Standards*** and made it mandatory for certain entities (that fall in scope with Capital Markets Board of Türkiye, Banking Regulation and Supervision Agency, Insurance and Private Pension Regulation and Supervision Agency and Borsa İstanbul regulations) which fulfill two out of the three following criteria for two consecutive reporting periods: assets of more than 500 million Turkish liras; annual net revenues of more one billion Turkish lira and more than 250 employees, beginning from 1/1/2024. Turkish Sustainability Reporting Standards is fully compliant with IFRS Sustainability Disclosure Standards as TSRS 1, ***"General Requirements for Disclosure of Sustainability-Related Financial Information",*** and TSRS 2 ***"Climate-related Disclosures"***.

In accordance with the TSRS 2 Climate-related Disclosures, entities are obliged to disclose Scope 1, Scope 2 and Scope 3 greenhouse gas emissions according to the GHG Protocol. However, when the current data acquisition and reporting capacity of businesses analyzed in Türkiye, the transition provision for Scope 3 emissions provided by the standard for financial institutions has been extended by one year and to all sectors.

Approximately 500 companies are currently included within the scope of corporate sustainability reporting. It is anticipated that this scope will be expanded on an annual basis, with the aim of incorporating a greater number of companies within the aforementioned reporting.

4.2.1.7 Introduction of Türkiye Green Taxonomy

Türkiye plans to establish Türkiye Green Taxonomy with a legislation. The aim of the legislation is to support economic activities in line with sustainable development goals, encourage the flow of finance to sustainable investments and prevent greenwashing in the market. Türkiye's Green Taxonomy currently consists of 6 environmental targets: reduction of greenhouse gas emissions, adaptation to climate change, sustainable use and conservation of water and marine resources, transition to circular economy, pollution prevention and control, protection and restoration of biodiversity and ecosystems.

4.2.1.8 Green Asset Ratio

The Banking Regulation and Supervision Agency (BRSA) in cooperation with the Banks Association of Türkiye prepared the "***Draft Communiqué on Green Asset Ratio (GAR)***" and submitted it to the opinions of public and relevant parties in October 2023. The Draft Communiqué defines the green economic activities and

the GAR calculation methodology in line with international best practices, so that the financing provided by financial institutions to this area can be measured and monitored in a reliable, comparable and consistent manner. While the Draft is primarily based on the European Union (EU) Taxonomy in order to ensure international recognition and reputation it also adopts that takes into account the national legislative and implementation infrastructure, current conditions and needs in Türkiye The GAR, is expected to increase the real sector's financing opportunities for green transformation by reducing information asymmetry, increasing market discipline and facilitating the provision of funds from international markets.

The Draft Communiqué aims initially, in the first stage, at enabling the banks to produce comparable and reliable data on green assets and to conduct self-assessment regarding their green banking activities. Accordingly, in the first stage, banks are expected banks to report their GAR to only the BRSA and there will be no target ratios. As practices and international standards in this field mature, introducing disclosure obligations or target ratios may be considered to encourage banks to increase green financing flows. The Draft Communiqué is planned to be published and enter into effect by the end of 2024.

4.2.2 ENERGY INDUSTRIES

Overview

The energy sector is responsible for approximately 71.8% Türkiye's CO2 emissions. This situation increases the urgency of the decarbonization process of the sector from the perspective of combating climate change. Various policy documents such as National Energy and Mining Policy (2017), ,12th Development Plan and the Strategic Plan of the MENR (2019-2023); have been published in recent years which directly or indirectly targets GHG emission reduction in the energy sector.

12th Development Plan (2024-2028):Türkiye's main energy objective is to achieve a competitive structure that maximizes self-sufficiency in energy by utilizing domestic and renewable energy resources, use of nuclear technology in electricity generation, increase energy efficiency, prioritize localization in energy technologies, integrate new technologies, and strengthen Türkiye's strategic position in international energy trade, based on the uninterrupted, high-quality, sustainable, reliable and affordable supply of energy, source diversification in energy supply and the 2053 net zero emission target. Policies and measures to reduce carbon emissions in energy sector are as follows:

- Nuclear energy will be included in the electricity generation portfolio, and efforts will be carried out on the installation and localization of nuclear technologies.
- Akkuyu Nuclear Power Plant (NPP) will be commissioned.
- Efforts to increase the installed capacity of nuclear power will continue.
- Efforts will be carried out on new technologies such as small modular reactors, fusion technologies, and advanced generation reactors.
- Implementations to make public buildings more efficient will continue.
- In order to accelerate the energy transformation of buildings, energy efficient buildings supported by renewable energy will be widespread and relevant regulations will be developed.
- Alternative methods such as energy performance contracts, energy service companies model and use of credit guarantee fund will be expanded in the field of energy efficiency, especially in buildings.
- Studies on heat market legislation will be completed, the use of district heating/cooling systems and heat pumps will be expanded in technically and economically suitable places, and studies will be carried out to increase geothermal sourced heating.
- Energy efficiency investments with priority given to energy-intensive sectors will be supported by taking into account competitiveness and domestic production.
- Activities such as awareness-raising, promotion and training will be carried out in order to improve public awareness on energy efficiency.
- The institutional structure and human resources in the field of energy efficiency will be strengthened.

The **Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy** (No 5346) has entered into force in 2005 in order to progress on extending the use of renewable energy resources for power generation, increasing resource diversity, reduction of waste, protection of the environment, and development of renewable technology manufacturing industry. By the Law No. 7257 amending the Renewable Energy Law No. 5346, which was published in the Official Gazette No. 3122 of 02 December 2020, new renewable energy support mechanism which will be forced on July 1st, 2021, is formed and By the Presidential Decree No. 7189 was published in the Official Gazette No. 32177 of April 30th, 2023, new renewable energy support mechanism's details were announced.

As a roadmap for energy policies in Türkiye, **Strategic Plan of the MENR (2019-2023)** targets "providing the highest contribution to national welfare by utilizing energy and natural resources in the most efficient and environmentally-conscious manner". The plan is important due to direct impact of the energy sector emissions on climate change. Some targets in the document are listed as follows:

- the ratio of installed electrical power based on renewable energy resources to the total installed power will be increased
- to have a strong and reliable energy infrastructure; natural gas storage and number of residential areas which uses natural gas will be increased.
- energy efficiency measures with rehabilitation of the state-owned power plants, using more efficient street lightings (LED), and expanding regional heating systems
- nuclear energy will be included and increasing its share in energy supply will continue.

The **Türkiye National Energy Plan** has been prepared in accordance with Article 20, which is titled as Security of Supply, of the Electricity Market Law No. 6446 and Additional Article 2 of the Natural Gas Market Law No. 4646. With this plan, it was aimed to forecast the energy sector in line with Türkiye's long-term greenhouse gas emission target. The plan published on December, 2022 by the MENR. According to the Plan, Türkiye will reach approximately 33 GW of solar installed power capacity, 18 GW of wind installed power capacity, 35 GW of hydroelectric installed power capacity and 7.2 GW of nuclear installed power capacity by 2035. Türkiye also plans to reach the currently unavailable battery and electric power capacity of 2.1 GW and 1.9 GW by 2030, respectively at the same year.[170]

Hydrogen Technologies Strategy and Roadmap of Türkiye, **Carbon Dioxide Capture and Utilization Technologies Roadmap and Implementation Plan for Türkiye** and **Offshore Wind Roadmap of Türkiye** are planned to be published in 2023. Hydrogen production supported by carbon capture, utilization and storage from domestic coal enables the use of Türkiye's resources with added value. Coal Gasification and Hydrogen Production R&D carried out in Çayırhan and Soma TRIJEN Project are important steps in this field.

Energy efficiency has also been an important part of Türkiye's energy and climate policy over the last decade. The Department of Energy Efficiency and Environment under the MENR is responsible for coordination of energy efficiency

[170] MENR, 2022.

activities all across the country. Several other institutions like MoEUCC, MoIT, MoTI, Small and Medium Enterprises Development Organization (KOSGEB) also carry out studies and projects for energy efficiency.

The **Energy Efficiency Law** (No. 5627) entered into force in 2007. The law provides a legal framework for policies, strategies and activities regarding effective use of energy, prevention of loss, relieving the burden of energy cost on the economy and protecting the environment.

The Energy Efficiency 2030 Strategy and **2nd National Energy Efficiency Action Plan (2024-2030)**[171] was developed and announced to the public on January 8, 2024, with the aim of achieving Türkiye's new energy efficiency vision and strategy.

The Energy Efficiency 2030 Strategy defines 10 strategic objectives and 23 goals, taking into account Türkiye's development priorities, economic and energy policies, technological capabilities, socio-cultural dynamics, and international developments.

The following issues were determined as strategic goals and activities were foreseen depending on these goals:

- To make energy efficiency a policy component taken into account in all decision-making processes, within the framework of the perspective of strengthening energy supply security, achieving the net zero emission goal and increasing total factor efficiency.
- To increase awareness-raising activities of society and to strengthen cooperation with external stakeholders in order to ensure that energy efficiency is evaluated within a social mobilization approach.
- To support the investments that will encourage green transition and increase in energy efficiency, and to accelerate the transition with innovative financing tools.
- To carry out a comprehensive improvement program in which the public will play a leading role in reducing carbon emissions with energy efficient solutions and approaches in buildings.
- To increase the use of energy efficient equipment, systems and technologies, especially digital applications and innovative technologies, and to support their development primarily with domestic opportunities.

[171] MENR, 2024.

- To increase energy efficiency projects and investments to encourage the green transition efforts of the industry sector.
- To ensure that energy efficient solutions and applications are given priority in the transportation sector in order to balance the high energy use caused by increased mobility, and to popularize multi-modal and integrated transportation systems.
- To implement energy-efficient agricultural practices compatible with the objectives of increasing the competitiveness of the agricultural sector, improving agricultural irrigation efficiency and making the food supply chain sustainable.
- To ensure market transition of environmentally friendly, circular natured and energy efficient products.
- To increase efficiency throughout the entire value chain of energy and reduce losses in production, transmission and distribution.

To achieve these objectives and goals, the 2nd NEEAP includes 61 actions and 266 activities across 7 sectors, including buildings and services, energy, transportation, industry, agriculture, start-ups and digitalization, and cross-cutting areas.

To reach the set targets by 2030, a total investment of 20.2 billion dollars is expected from both the public and private sectors. Over the period 2024-2030, it is projected to achieve cumulatively 37.1 Mtoe of energy savings and a reduction of 100 million tons of CO2 equivalent emissions.

The following activities are included in the 12th Development Plan:

- 508.3. Alternative methods such as energy performance contracts, energy service companies model and use of credit guarantee fund will be expanded in the field of energy efficiency, especially in buildings.
- 508.5. Energy efficiency investments with priority given to energy-intensive sectors will be supported by taking into account competitiveness and domestic production.
- 508.6. Activities such as awareness-raising, promotion and training will be carried out in order to improve public awareness on energy efficiency.
- 508.7. The institutional structure and human resources in the field of energy efficiency will be strengthened.

According to the Department of Energy Efficiency and Environment data, between 2000-2022 there was an annual decrease of 1.7% in both primary energy intensity index and final energy intensity index. In 2022, the primary energy intensity decreased 6.23% when compared to the previous year whereas the final

energy intensity decreased 7.86%. If we are to make a comparison with the data in 2000, the primary energy intensity and the final energy intensity indices improved 31.2% and 32.3% respectively (DEEE, 2022). According to the energy efficiency index (ODEX), there has been an improvement of 24.8% in total and 1.8% on an annual basis in Türkiye during the period of 2000-2016 in terms of energy efficiency.

Türkiye commenced efforts to enact energy efficiency legislation and to pursue EU alignment process with the adoption of the **Energy Efficiency Law (No. 5627)** in 2007, which targets industrial facilities, the building, service and transport sectors, and also power plants; generation, transmission and distribution networks. Following the publication of the Energy Efficiency Law in 2007, secondary regulations such as the **By-law on the Energy Performance of Buildings**, the **By-law on energy efficiency of the utilization of energy resources and energy**, the **By-law on Supporting Energy Efficiency in small and medium-sized enterprises**, the **communiqué on procedures and principles regarding the calculation of efficiency of cogeneration and micro-cogeneration** has been developed. The EE Law introduced, among other measures, energy audits, an energy management program, the establishment of EE companies and financial support schemes. Regulations issued in accordance with the EE Law are;

- The **By-law on Energy Performance of Buildings (EPB)** dated 2008 and amended in 2010, 2011, 2017 and 2022 introduces a common methodology for calculating the energy performance in buildings and sets **Minimum Energy Performance Standards (MEPS)** for new buildings and buildings subject to major renovation.
- The **Communiqué on Procedures and Principles Regarding the Calculation of Efficiency of Cogeneration and Micro-cogeneration** was published in 2014 in parallel with EU Directive (2012/27/EU).
- The **By-law on Supporting Energy Efficiency in SMEs**,
- Similarly, Türkiye has also adopted the **EU Eco-Design and Labelling Directives** (2010/30/EU and 2009/125/EU).
- Presidential Decree on the Procedures and Principles Regarding Energy Performance Contracts in the Public Sector.

Table 22 contains Türkiye's energy sector policies and measures for reducing the Country's greenhouse gas emissions. Following the table, each policy/measure is described in the following subsections.

Table 22 – Energy sector policies and measures

PaM	Sector(s) affected	GHG(s) affected	Objective and/or activity affected	Type of instrument	Status	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact *(not cumulative, in kt CO2 eq.)* ***2030***
1 - Renewable Energy Sources Support Mechanism (YEKDEM)	Energy	CO2	Increase in renewable power generation	Regulatory, Fiscal	Implemented	2011	MENR, EMRA	NE
2 - Renewable Energy Resource Areas (YEKAs)	Energy	CO2	Increase in renewable power generation	Fiscal, Economic	Implemented	2016	MENR	NE
3 - Electricity Generation from Nuclear Energy	Energy	CO2	Decreasing GHG emissions through use of nuclear energy	Infrastructure Development	Adopted	2010	MENR	NE
4 - Cogeneration and Trigeneration	Energy	CO2	Dissemination of cogeneration systems with the cogeneration plant efficiency certificate issued for the facilities that provide minimum efficiency value, electricity/heat ratio value and primary energy saving of at least ten percent or more	Regulatory	Implemented	2014	MENR	NE

5 - Mandatary Energy Audit Programs	Energy	CO2	Determination of energy saving potential in industry, building, service, and energy	Regulatory	Implemented	2012	MENR	NE
6 - Energy Sector Research and Development Projects Support Program (ENAR)	Energy	All gases	Promotion of sustainable energy policies, supply security, local energy technologies and industry products and systems.	Economic, other	Implemented	2010	MENR	NE
7 - Incentives to Energy Transformation in Agriculture Sector	Energy	CO2	Promotion of water and energy efficient irrigation systems through financial support and awareness raising Sustainable Energy Financing Mechanism for Solar Photovoltaic Systems in Forest Villages in Türkiye	economic, regulatory, informative, other	Implemented	2017	MENR	NE
8 - Inspection Regulation	Energy	CO2	Ensuring effectiveness of energy efficiency applications	Regulatory	Implemented	2018	MENR	NE
9 - Public lighting	Energy	CO2	Decreasing GHG emissions resulted from public lighting	Infrastructure Development	Implemented	2021	MENR	NE
10 - Development of Electricity Storage Capacity	Energy	CO2	Supporting increase of renewable power generation	Infrastructure Development	Adopted	2022	MENR, EMRA	NE

11 - Energy management Program	Energy	CO2	Increasing energy efficiency of end-use, public and energy sectors	Regulatory	Implemented	2007	MENR	NE

4.2.2.1 Renewable Energy Sources Support Mechanism (YEKDEM)

Türkiye places special importance on renewable energy as a critical tool in combating climate change. Under the 12th Development Plan, the country has set ambitious targets for 2028, aiming to expand installed wind power capacity to 18,000 MW and solar power capacity to 30,000 MW, while increasing the share of renewable resources in electricity generation to 50%. YEKDEM and YEKA initiatives serve as the two main policy frameworks driving these advancements.

12th Development Plan Targets	**2022**	**2023**	**2028**
Installed Wind Power Capacity (MW)	11,396	11,700	18,000
Installed Solar Power Capacity (MW)	9,425	11,350	30,000
Share of Renewable Resources in Electricity Generation (%)	42.4	40	50

The introduction of the **Renewable Energy Sources Support Mechanism (YEKDEM)** has significantly accelerated renewable energy investments especially for wind and solar power. Within the frame of the support mechanism, the retail companies assigned by EMRA are required to purchase the produced electricity from the electricity manufacturers which are subject to this mechanism on the tariffs regulated by the legislation and the electricity manufacturer cannot sell the produced electricity to other companies under the open market conditions. The feed-in tariff prices which are given below are applied for the periods specified afront side, for electricity generation facilities based on renewable energy resources with RES Certificate which will be commissioned from 1 July 2021 until 31 December 2030. These prices are escalated on the basis of source within a period of three months each year, according to Domestic Producer Price Index, Consumer Price Index, the average daily US dollar and Euro forex buying rates.

Type		**YEKDEM Price (01-30.09.2024)** *(TL Kuruş/kWh)*	**YEKDEM Implementation Period** *(year)*	**$YEKDEM_{MIN}$** *($-cent/kWh)*	**$YEKDEM_{MAX}$** *($-cent/kWh)*	**Local Contribution Price (01-30.09.2024)** *(TL Kuruş/kWh)*	**Local Contribution Price Implementation Period** *(year)*
Hydro	**Lake**	**252,02 (7,43 $-cent/kWh)**	**10**	**6,75**	**8,25**	**50,41 (1,49 $-cent/kWh)**	**5**
	River	**236,27 (6,96 $-cent/kWh)**	**10**	**6,30**	**7,70**	**50,41 (1,49 $-cent/kWh)**	**5**

Wind	Onshore	185,52 (5,47 $-cent/kWh)	10	4,95	6,05	50,41 (1,49 $-cent/kWh)	5
	Offshore	252,02 (7,43 $-cent/kWh)	10	6,75	8,25	67,28 (1,98 $-cent/kWh)	5
Biomass	Waste Gas	185,52 (5,47 $-cent/kWh)	10	4,95	6,05	50,41 (1,49 $-cent/kWh)	5
	Biometh	302,78 (8,93 $-cent/kWh)	10	8,10	9,90	50,41 (1,49 $-cent/kWh)	5
	Termal Removal	236,12 (6,96 $-cent/kWh)	10	5,75	8,00	37,76 (1,11 $-cent/kWh)	5
Geothermal		353,58 (10,42 $-cent/kWh)	15	9,45	11,55	50,41 (1,49 $-cent/kWh)	5
Solar		185,52 (5,47 $-cent/kWh)	10	4,95	6,05	50,41 (1,49 $-cent/kWh)	5
Storage Wind/Solar		218,78 (6,45 $-cent/kWh)	10	5,85	7,15	67,28 (1,98 $-cent/kWh)	10
Pumped Storage Hydro		353,58 (10,42 $-cent/kWh)	15	9,45	11,55	67,28 (1,98 $-cent/kWh)	10
Wave		236,27 (6,96 $-cent/kWh)	10	6,30	7,70	67,28 (1,98 $-cent/kWh)	10

1. Presidential Decree No. 7189 dated 30/4/2023, YEKDEM Prices for YEK Certified production facilities that entered into operation between 01/07/2021 and 31/12/2030 are updated monthly with weight ratios of 25% PPI, 15% CPI, 30% US Dollar and 30% Euro.
2. With this decision, the update made for YEKDEM Prices, the US Dollar equivalent of the price calculated in "Turkish Lira kuruş/kWh" cannot be outside the price range of YEKDEMmin and YEKDEMmax.
3. There is no ceiling or floor price limitation for the Local Contribution Prices to be applied.
4. In calculating the equivalent of YEKDEM and Local Contribution Prices in US Dollars, the TCMB foreign exchange buying rate (33.9233 TL/$) dated 29/08/2024 was used.
5. YEKDEM and Local Contribution Prices are the prices applied in September 2024 for licensed production facilities that entered into operation after 1/7/2021 and are included in the YEKDEM Mechanism.

As of the current stage, a new decision has been made with the Presidential Decree No. 7189 regarding the prices, periods and updating of these prices to be applied for electricity production facilities based on renewable energy sources with YEK Certificate to be put into operation between 01/07/2021-31/12/2030. Within this framework, the period of benefiting from YEKDEM has been extended until 31/12/2030.

With the contribution of the YEKDEM, in terms of power generation, renewable energy installed capacity reached to 61,659 MW (56.31% of total installed capacity) at the end of the 2023. Approximately 71% of the renewable energy

was generated from the hydraulic sources and wind.[172] According to TEIAŞ data, the wind power plant installed capacity, which used to be 18.9 MW in 2002 reached 6,516.2 MW at the end of 2017 and 11,806 MW at the end of 2023 with 366 power plants in total.

The YEKDEM serves as an illustrative example of a policy framework that can be effectively implemented in various national contexts to foster the adoption of renewable energy sources. Through the implementation of YEKDEM, Türkiye has significantly accelerated the incorporation of renewable energy into its electricity production mix, thereby demonstrating the potential impact of targeted policy interventions on enhancing the sustainability of energy systems. Other countries could implement similar financial mechanisms to increase their renewable energy shares in the electricity production.

4.2.2.2 The By-Law on Renewable Energy Resource Areas (YEKA)

The **By-Law on Renewable Energy Resource Areas (YEKA)** entered into force in 2016 for ensuring effective and efficient use of Türkiye's renewable energy sources by forming YEKA(s) on either property belonging to public / treasury or privately-owned property, rapidly completing investment projects by assigning these areas to investors, while ensuring high-tech equipment used in the renewable energy-based generation facilities. Also, the government awards limited-time purchase guarantees to support renewable energy investments and to incentivize local manufacturing of renewable generation assets.

Activity 511.1 in the 12th Development Plan includes the new YEKA tenders with local component requirements, alongside efforts to develop offshore YEKA projects.

Basically, YEKA model has two allocation models. One requires developers to include domestic businesses or establish domestic factories and to create employment for the local labor force and invest in R&D. The other one requires developers to use local production. Also, the By-Law requires that the equipment which will be used in electricity generation plants be supplied from a domestic manufacturer and to have a domestic goods certificate. This method will ensure that the local industry receives support in the renewable energy production as well. Moreover, the localization requirements also provide direct economic benefits for Turkish factories and manufacturers, in addition to accelerating

[172] TEİAŞ,2023_a

development of subsidiary industries. By-Law on Renewable Energy Resource Zones, which has come into force on October 9, 2016, introduced a new investment model to support renewable energy investments and incentivize local manufacturing of renewable generation assets. The main purposes of the By-Law are to use renewable energy resources much more efficiently and effectively by identifying renewable energy zones on the public, treasury, or private-owned territories; to realize the renewable energy investments much more rapidly; to manufacture renewable energy equipment in Türkiye; to use locally-manufactured equipment/components; and to contribute to research and development activities through technology transfer.

In order to encourage generation facilities based on renewable energy resources, 10% of the relevant fees are collected in applications for pre-license and license applications to establish a production facility based on renewable energy sources, and in the pre-license and license amendment transactions. In addition, for the generation facilities based on the specified resources, annual license fee is not charged for the first 8 years from the date of the first temporary acceptance of the generation facility.

From the production facilities based on renewable energy resources that are in operation as of 18 May 2005 and which will be operational until 31 December 2025; 85% discount is applied to permit, rent, easement and usage permit fees for 10 years from the date of license, from transportation routes and energy transmission lines up to the connection point to the system specified in their licenses, including those to be transferred to Turkish Electricity Transmission Corporation (TEIAS) and distribution companies.

Due to the financial initiatives that have been implemented over the recent years, the installed power for solar-based electricity generation, which used to be 40.2 MW with 112 solar plants at the end of 2014, increased up to a total of 3,420.7 MW with 3616 solar plants at the end of 2017 and reached 9,425 MW with 9,353 solar plants as of the end of 2022. As of June 2024, installed power for solar power plants has reached to 15.135 MW with 23.863 solar power plants combining the licensed and unlicensed. Of these, the unlicensed installed solar capacity alone corresponds to 13.4 GW with 23.823 power plants. Given the licensed projects as well as previously licensed ones becoming operational, this number is expected to rise.

The following activities are included in the 12th Development Plan:

- 511.1. New Renewable Energy Resource Areas (YEKA) tenders with local component requirement will be held, and efforts will be made to develop offshore YEKA projects.

4.2.2.3 Electricity Generation from Nuclear Energy

In several policy documents, such as the **12th Development Plan** and **Türkiye National Energy Plan** nuclear power will be one of the options to provide supply security and reduce GHG emissions. **Türkiye National Energy Plan**, announced by the MENR, covers the years from 2020 to 2035. The target for the installed power of nuclear energy is 7.2 GW by 2035. The plan forecasts nuclear energy with a 29.3% share of the primary energy supply by 2053 following the net-zero carbon emission target.

The same importance and work continue during the 12th Development Plan. Türkiye's nuclear targets in the 12th Development Plan are as follows:

- 510. Nuclear energy will be included in the electricity generation portfolio, and efforts will be carried out on the installation and localization of nuclear technologies.
- 510.1. Akkuyu Nuclear Power Plant (NPP) will start electricity generation with all its units.
- 510.2. Efforts to increase the installed capacity of nuclear power plants will continue.
- 510.3. Efforts will be carried out on new technologies such as small modular reactors, fusion technologies, and advanced generation reactors.
- 510.4. Efforts will be carried out to establish a waste facility for the safe disposal of nuclear waste.

Within this framework, construction activities of Akkuyu NPP (with four units and 4800 MW installed capacity) is going on. Commissioning permit for the first unit is granted in 2023. The second NPP project is planned to be implemented in Sinop province. The EIA positive decision for the project is made by MoEUCC in 2020 and site permit is granted by Nuclear Regulatory Authority in 2024. Site allocation is completed for the 3rd NPP Project in Kıyıköy as well. Negotiations and site studies for 2nd and 3rd NPP projects are ongoing.

Co-Benefits of Electricity Generation from Nuclear Energy

In 2023 the primary energy demand of Türkiye was 165,350 kTOE and as a developing country due to 12th Development Plan, the primary energy demand of Türkiye is expected to be 190,000 kTOE by 2028. Considering that about 70% of

GHG emissions in Türkiye are energy-related the decarbonization of energy sector while security supply sustained is crucial.

The share of intermittent renewable energy sources such as wind and solar in total electricity generation is planned to be increased due to Türkiye National Energy Plan. Having nuclear energy as a component in the energy mix of Türkiye will facilitate the successful integration of renewables to the energy system, minimize the cost of economy-wide decarbonization, create meaningful and long-lasting jobs and strengthen energy security.

The implementation of NPP projects in Türkiye will help to increase the investments for intermittent renewable energy sources as the having nuclear and renewable energy in energy mix together is an effective way to combat with climate change while decarbonization of energy system is in process. This is because nuclear power is more readily available to meet energy demands when renewable energy sources might not be as readily available.

Besides the huge contribution for decarbonization of energy system nuclear energy sector also employs a considerable green workforce around the world. The implementation of NPP projects will increase the amount of green workforce in Türkiye as well.

Nuclear power also has the potential to play a significant role in the effort to limit future air pollutants and GHG emissions while meeting global energy needs and protect human health. As well as driving climate change, emissions of various toxic gases (fine particles, nitrogen dioxide, sulfur dioxide, nitrates or phosphates etc.) from burning of fossil fuels is a major source of air pollution. Nuclear power also contributes to avoid the emission of these air pollutants.

4.2.2.4 Cogeneration and Trigeneration

One of the most important technologies that can be applied to reduce our energy consumption and meet the needs in the most efficient way is cogeneration systems. Cogeneration systems reduce energy imports by saving primary energy. For this reason, care is taken to support cogeneration systems in the policies created by the MENR. With the **By-law on Unlicensed Electricity Production in Electricity Market**, cogeneration power plants to be established to meet their own needs are exempted from obtaining licenses and establishing companies. Efficiency certificates have been issued for these plants by our Ministry since 2014.

Activity 508.4 in the 12th Development Plan includes completing studies on heat market legislation, expanding district heating/cooling systems and heat pumps in technically and economically suitable areas, and increasing geothermal-sourced heating.

So far, 227 plant efficiency certificates have been issued. 97 of the certified plants are in the industrial sector and 18 are those that generate electricity from waste heat. Total capacity of cogeneration plants entitled to efficiency certificates amounts to 687 MWe and 731 MWt. This translates into cumulative primary energy savings of around 24.2 TWh. As a result of energy savings achieved through certified cogeneration plants, it is estimated that 9.1 Mt of CO2 equivalent emissions have been avoided.

The following activities are included in the 12th Development Plan:

- 508.4. Studies on heat market legislation will be completed, the use of district heating/cooling systems and heat pumps will be expanded in technically and economically suitable places, and studies will be carried out to increase geothermal sourced heating.

4.2.2.5 Mandatory energy audits programs

Pursuant to the EE Law and the **By-law on Increasing Efficiency in the Use of Energy Resources and Energy**, relevant sides oblige to conduct energy audits in;

- Industrial plants with a consumption of more than 5,000 toe per year,
- Buildings in the services sector with a total built area over 20,000 m2,
- Public buildings with a total construction area over 10,000 m2 or with an annual energy consumption above 250 toe.

The audits need to be renewed every four years and every ten years for public buildings.

As a new obligation; thermal plants having an installed power capacity of more than or equal to 20 MW will conduct energy audits mandatorily for using their waste heat potential (in buildings for heating and cooling purposes and also in industry, agricultural production, aquaculturing, cold storage and fresh water production).

4.2.2.6 Energy Sector Research and Development Projects Support Program (ENAR)

Energy Sector Research and Development Projects Support Program (ENAR) was developed in order to support, monitor, complete and evaluate the projects that

include **technology development and innovation-focused** research, development and improvement in order to convert the scientific and technological information to be established in a way that will serve energy policies, supply security, local energy technologies and industry to products and systems. Amendments made in order to make the By-Law published on ENAR on 8 June 2010 operable were published in By-law Amending ENAR By-law on 21 February 2013.

4.2.2.7 Incentives to energy transformation in agriculture sector

For the modernization of individual irrigation systems of investors, 50% partial grant support was provided to 18,466 projects, and 183,295 ha of land were irrigated with modern methods. New irrigation infrastructure constructed for 30,267 ha and construction for 81,149 ha is continuing. Low-interest loan for the replacement of tractors and harvesters with energy-efficient ones has been given since 2018. For purchases of tractors support payments were made to 5,400 projects and for harvester purchases applications were accepted for 28 projects. Between 2017-2021 consolidation registration procedures are completed for total of 6,022 million ha of land. 50% grant support for investments has been provided to the projects of farmers under the Program for the Support of Rural Development Investments. Support based on electricity generation from renewable energy for agricultural production and greenhouses using renewable energy sources. The **Sustainable Energy Financing Mechanism for Solar Photovoltaic Systems in Forest Villages in Turkey Project** is a good example for incentives in agriculture sector energy emissions.

The **Modern Irrigation Systems Incentive** has enabled a significant progress in irrigation system supplies for the producers to have in-farm modern pressure irrigation systems by enabling the producers to use low interest rate loans to meet financial needs, develop agricultural production and increase productivity and quality. Approximately 800 Agricultural Engineers working at the Agricultural Credit Cooperatives have taken applied training and prepared numerous projects. Within this framework, financial support of 43.5 million TRY has been provided in the form of loans with No interest rate for 11,419 projects which constitute an area of 9,700 ha, through the Agricultural Credit Cooperatives.

Approximately 600 million kWh/year energy is consumed at an installed power of 500 MW in pumped irrigations put into operation by the General Directorate of State Hydraulic Works. Therefore, it is aimed by DSI to meet 50 MW (60 million kWh/year) of energy consumption until 2023, and 500 MW (600 million kWh/year) in 2030 with Solar Power Plants at pumped irrigations. In accordance with the

strategy of "reducing foreign dependence in energy and increasing the ratio of renewable energy resources in energy distribution" in Türkiye's energy policies and the mission of DSI, studies have been carried out on the construction of a Solar Power Plant (SPP) in order to turn the investments made so far into benefits by making the promoted irrigation operational. Pilot field work has started with Adıyaman Samsat Pumped Irrigation.

4.2.2.8 Inspection Regulation

With the **By-law on Energy Efficiency Inspection** published on Official Gazette of 6 July 2018 with the number 30470, the energy efficiency inspection mechanism has been included in the Energy Efficiency Law numbered 5627.

4.2.2.9 Public Lighting

Türkiye aims to increase energy efficiency in public lighting, **Procedures and Principles of Using LED luminaires in the General Lighting Facilities** is published and applications has been started in new facilities in 2021.[173]

4.2.2.10 Development of Electricity Storage Capacity

Türkiye emphasizes the strategic importance of electricity storage. Accordingly, the 12th Development Plan establishes a target of achieving 5,000 MW of battery storage capacity by 2028.

12th Development Plan Targets	2022	2023	2028
Battery Storage Capacity (MW)	0	0	5,000

Legal entities undertaking to establish an electricity storage facility in order to obtain a pre-license for the establishment of an electricity generation facility based on wind or solar energy up to the installed capacity of the electricity storage facility they undertake to establish, or legal entities holding electricity generation licenses based on wind or solar energy can apply to EMRA for a capacity increase up to the installed capacity of the electricity storage facility they undertake to establish an electricity storage facility from generation facilities that are partially or fully in operation. For applications within this scope, measurement data based on wind or solar energy is not required and these applications are exempt from the competition application for capacity allocation. In applications for pre-license or license to establish an electricity generation facility with storage, the pre-license and license fee is evaluated over

[173] MENR, 2021.

the total mechanical installed power of the electricity generation facility. These issues are regulated by EMRA Decisions[174] and the By-law Amending the By-Law on Electricity Market License[175]. It has aimed to increase the wind or solar energy capacity, create new investment opportunities, establish an electricity storage unit, and contribute to the security of supply by reducing the intermittent generation profile and imbalances.

Subsequent to these amendments to the By-Law on Electricity Market License, EMRA accepted applications from November 2022 to September 2023 for renewable projects co-located with storage facilities. As of June 2024, EMRA has granted 684 pre-licenses for such renewable power projects with energy storage systems, amounting to a combined capacity of 18.6 GW of wind and 14.8 GW of solar power generation.

4.2.3 BUILDINGS

Overview

Considering the high GHG emission reduction potential in the buildings, Türkiye gave special importance to increasing energy efficiency in the buildings sector in the **Nationally Determined Contribution**. Constructing new residential buildings and public buildings with high energy efficiency performances has been the focus to reach the goals that are identified in the Nationally Determined Contribution on the buildings sector, which are:

- Constructing new residential buildings and non-residential buildings as energy efficient in accordance with **By-law on the Energy Performance of Buildings**
- Creating **Energy Performance Certificates** for new and existing buildings so as to control energy consumption and greenhouse gas emissions and to reduce energy consumption per square meter
- Reducing the consumption of primary energy sources of new and existing buildings by means of design, technological equipment, building materials, development of channels that promote the use of renewable energy sources (loans, tax reduction, etc.)

[174] Published in the Official Gazettes dated 24 November 2022 and numbered 11412-1 and 11412-2 and published in the Official Gazette dated 25 November 2022 and numbered 32024.

[175] The Official Gazette dated 19 November 2022 and numbered 32018.

- Dissemination of Green Building, passive design, zero-energy house design in order to minimize the energy demand and to ensure local production of energy

Türkiye plans to realize measures on reducing energy intensity of buildings through a set of national policies and actions, particularly **National Energy Efficiency Action Plan (NEEAP)**. These are described in several policy documents and legislation such as **By-Law on Energy Performance of Buildings (BEP)**, 12th Development Plan, Climate Change Mitigation Strategy and Action Plan, Climate Change Adaptation Strategy and Action Plan.

According to the legislative framework and policies that are mentioned above, Türkiye has the following objectives of GHG emission reduction in the buildings sector:

- Legislative work will be undertaken to improve minimum energy performance classes in buildings and the minimum required ratio of renewable energy usage.
- ***By-law on Amending the Energy Performance Regulation in Buildings***[176] introduces provisions requiring all buildings with a total construction area of more than 2,000 square meters to comply with the "***Nearly Zero Energy Buildings***" concept. This concept prioritizes energy efficiency beyond standard buildings and mandates that a portion of the energy used be sourced from renewable energy. Accordingly, these buildings must be constructed to achieve at least a 'B' energy performance rating. Additionally, a minimum of 10% of the energy consumed in these buildings must come from renewable sources, such as solar panels or heat pumps. Activities such as training sessions and seminars will be organized for relevant authorities, practitioners, and the industry regarding Nearly Zero Energy Buildings (nZEB). The mandatory usage ratio of renewable energy in nZEB will be gradually increased over the years. The nZEB criteria will be reviewed by 2030.
- Educational and seminar activities will be conducted for relevant authorities, practitioners, and the industry on green buildings and settlements, including the National Green Certification System (Yes-TR).
- Systems, software, and infrastructure will be developed to enable the potential use of Yes-TR in other countries.

[176] Official Gazette Date: 19.02.2022, Official Gazette Number: 31755

- Awareness, education, and sensitization activities will be carried out in collaboration with stakeholders including NGOs. Guides or checklists will be prepared according to different building typologies and technologies and highlight the benefits of renewable energy and new technologies.
- Efforts will be made to include the Energy Performance Certificate (EKB) information of properties in real estate listings, working with civil society organizations in the real estate sector to enhance awareness.
- Incentives and awareness programs will be promoted to encourage buildings and settlements to obtain the National Green Building/Settlement Certificate.
- Public buildings will be certified to serve as examples for the private sector.
- Field research will be conducted annually to verify the results specified in the certifications.
- Starting from 2026, new public buildings with a total construction area exceeding 10,000 m^2 will be required to have green building certification.
- All existing and new buildings will have an "Energy Performance Certificate" which indicates the building energy performances of buildings.
- By-Law on Energy Performance of Buildings suggests that all new buildings must be "C Class" for their energy performance.
- From January 1, 2023, to January 1, 2025, if the total construction area of a building exceeds 5,000 square meters, compliance with these criteria is compulsory, and the use of renewable energy sources must account for at least 5% of the total energy usage.
- Solar thermal collectors for central heating and sanitary hot water will be installed at new hotels, hospitals, dormitories, other Non-residential buildings used for accommodation purposes, as well as sports centers with a usage area of more than 2,000 m^2.
- Financing will be provided for increasing energy efficiency / renewable energy applications in buildings.
- Energy intensities in each service sub-sector shall be decreased. The rates shall be determined in close collaborations with sector stakeholders, but they shall not be less than a 10% of the intensity for each sub-sector in 2012-2022.

Energy efficiency services are being spread throughout the country within the context of the new legislation. Three universities, one trade association and Energy Efficiency Consultancy companies have been authorized as **Energy Service Companies (ESCOs)**. The preliminary audits in building and industry sectors

in the last few years revealed a substantial amount of energy efficiency potential. Some of these are financed by the banks.

Türkiye's building codes are based on the By-law on Energy Performance of Buildings dated in 2008 which was amended in 2010, 2011, 2017 and 2022. The By-law introduced a common methodology (BEP-TR) for calculating the energy performance in buildings and set minimum energy performance standards (MEPS) for new buildings and buildings subject to major renovation. BEP-TR currently works under servers of MoEUCC.

Table 23 contains Türkiye's buildings sector policies and measures for reducing the Country's greenhouse gas emissions. Following the table, each policy/measure is described in the following subsections.

Table 23 – Buildings sector policies and measures

PaM	Sector(s) affected	GHG(s) affected	Objective and/or activity affected	Type of instrument	Status	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact *(not cumulative, in kt CO2 eq.)* ***2030***
1 - Increasing Energy Performance of New Buildings	Buildings	CO2	Increasing Energy Performance of New Buildings	Regulatory	Implemented	2008	MoEUCC	NE
2 - Near Zero Energy Buildings (NZEB)	Buildings	CO2	Increasing Energy Performance of New Buildings	Regulatory	Adopted	2022	MoEUCC	NE
3 - Increasing Energy Performance of Public Buildings and Building Complexes	Buildings	CO2	Promotion of central heating and utilization of solar power systems 15% Energy saving target in Public Buildings Energy Performance Contracts in Public Buildings Annual energy consumption in buildings and premises of public institutions will be decreased by 10% until 2015 and by 20% until 2023.	Regulatory	Implemented	2008	MoEUCC, MENR	NE

4 - Promotion of Thermal Insulation Standard (TS 825)	Buildings	CO2	Increasing energy efficiency of buildings	Regulatory	Implemented	2008	MoEUCC	NE
5 - Green Certificate Information System (Yes-TR)	Buildings	CO2, CH4	Reducing environmental impacts of buildings including energy consumption, waste, and others.	Voluntary	Adopted	2022	MoEUCC	NE
6 - Higher Financial Incentives for Better EPC Buildings	Buildings	CO2	Increasing energy efficiency of buildings through financial incentives	Economic, Regulatory	Implemented	2019	MoEUCC, MENR	NE
7 - Reducing heating related direct GHG emissions in buildings	Buildings	CO2	Reducing energy emissions of buildings and air pollution	Infrastructure Development	Implemented	2006	MoEUCC MENR	NE

4.2.3.1 Increasing Energy Performance of New Buildings

The By-law on Energy Performance of Buildings introduced an energy performance certificate (EPC) in 2011 in order to give information on primary energy demand and CO_2 emissions of new buildings and buildings that have been purchased or are rented.[177] In order to support the EPC system, BEP-TR software was developed. The By-law requires that **new buildings must have at least C class Energy Performance Certificates**. Within this framework, 1,476,447 buildings have received EPC between 2011-2023. 1,365,610 of them are C Class or above.

4.2.3.2 Near Zero Energy Buildings (NZEBs)

Türkiye amended the By-law on Energy Performance of Buildings in 2022. The revised By-law introduced the **Nearly Zero Energy Buildings (NZEB)** concept. The NZEB corresponds to a building with at least a B-class EPC and obtains at least 10% of its primary energy from renewable energy sources. Buildings with a total construction area of 2,000 m2 and above must be built as NZEB starting from January 1, 2025. During the transition period between 1 January 2023, and 1 January 2025, NZEB obligation will be required to buildings with a total construction area of 5,000 m2 and above and renewable energy of at least 5% of the building's primary energy need.

4.2.3.3 Increasing Energy Performance of Public Buildings and Building Complexes

The By-law on Energy Performance of Buildings made it compulsory to have **central heating** for new buildings having an area of more than 2,000 m2 since 1 April 2010. The installation of individual metering and control systems for central heating and hot water systems has been mandatory since 2 May 2012.

In existing buildings with individual heating system, Household Owners Law (Law No 634) requires at least 50% of flat owners in a building to agree on establishing individual heating systems instead of central heating.

In 2018, Türkiye allowed energy efficiency efforts in public buildings and facilities through energy service companies. According to this article, public buildings which have a total construction area of over 10,000 m2 or total annual energy consumption of over 250 toe should contract these companies to reduce their

[177] The authority of issuing EPC of the existing buildings is given to the organizations having the ind ependent consultancy and engineering certificate as well as EE consultancy companies authori zed by the MENR. (OJ dated 28 April 2017)

energy consumption or expenditures through **energy performance contracts** for at most 15 years. The Presidential Decree on the Procedures and Principles Regarding Energy Performance Contracts in the Public Sector (2020) aims to determine the procedures and principles regarding **energy performance contracts** to be concluded by public administrations within the scope of the government and other public institutions and organizations to reduce their energy consumption or energy costs.[178] As per the Decree, the relevant Communiqué and its appendixes, including; audit report format, technical specification, contract drafts, and other related documents published in April 2021.

Presidential Decree of 16 August 2019 aims that **public buildings** (with energy managers assigned according to Energy Efficiency Law no. 5627) **should save 15% of energy by 2023**. With this measure, Türkiye achieved a total of 31,855 toe energy savings between 2019-2021.

4.2.3.4 Promotion of Thermal Insulation Standard (TS 825)

The By-law on Energy Performance of Buildings requires buildings to comply with the Thermal Insulation Standard (TS 825).

4.2.3.5 Yes-TR

The **By-law on Green Certificate for Buildings and Settlements**[179] was introduced in 2017 to certify buildings and settlements which demonstrate environmentally friendly practices during their construction, design and operation. The Green Certificate is used in order to evaluate environmentally responsible parameters of construction projects, including but not limited to, construction materials, energy efficiency, water efficiency, indoor environmental quality, land use, urban design, social and economic sustainability. The **Green Certificate is currently a voluntary scheme** that encourages the use of best practices, some of which are not mandated by the existing regulations. The By-law was then revised in 2022 to further suit the needs of local conditions and ensure that it is up to date with the current national and international standards.

4.2.3.6 Higher Financial Incentives for Better EPC Buildings

Credit limits for A and B energy performance class buildings have been increased. For the A code 90% of the value of the household and for the B code 85% of the value of the household loan could be given by the bank different from the

[178] Published in the Official Gazette numbered 31220 on 21 August 2020.
[179] Official Gazette dated December 23, 2017 and numbered 30279

uncoded households.[180] The incentives specified in this provision are granted exclusively to buildings designated under the scope of urban transformation.

To promote energy efficiency in building sector, after the cabinet meeting held on 5 June 2022, it is announced that credit support for insulation of buildings up to 50,000 TRL per flat with 60-month term will be given by relevant banks.

In addition to industrial facilities, building, agriculture and service sectors are also included in the scope of Efficiency Improving Project Support as per The Law on Making Amendment in same Law which was enforced in December 25, 2021 with the number 7346.

4.2.3.7 Reducing heating related direct GHG emissions in buildings

11th Development Plan, while requiring a decrease in the use of natural gas in electricity production, continues to strengthen the access to natural gas at buildings with its Article 490.

4.2.4 TRANSPORT

Overview

Türkiye's GHG emissions from the transport sector has a significant share and an increasing trend. Therefore, GHG emission reduction policies in the transport sector have a particular importance. Türkiye's transport sector policies are framed with several policy documents including 12th Development Plan, National Transport and Logistics Master Plan, National Climate Change Strategy, National Climate Change Action Plan and National Intelligent Transportation Systems Strategy Document.

The policies and measures of the 12th Development Plan include "Reducing fuel consumption in transportation, promoting low-emission public transportation systems and micromobile solutions." Improving "Energy Efficiency in Transportation" is one of the important components of the program. In this context, the by-law on increasing energy efficiency in transportation entered into force in 2019. Another important component of the Plan is "Disseminating the use of public transportation, small engine volume and electric and hybrid vehicles, establishing smart bike networks in appropriate residential areas and creating pedestrian paths closed to traffic" and "Disseminating the use of low fuel consumption vehicles in the public sector". The following activities are included in the 12th Development Plan:

[180] The Official gazette numbered 30666 in January 2019.

- 469.1. The Mobility Vehicle and Technologies Roadmap study will be updated in line with all vehicle groups and developments.
- 469.2. Efforts will be directed towards investment and technology development for hydrogen fuel cells and components, and hydrogen-based engines.
- 469.4. Minimum requirements for vehicle charging station technology will be determined in line with EU practices.
- 469.5. A roadmap for the establishment of charging infrastructure covering all vehicle groups will be determined and state aid will be established.
- 470.1. For the 2053 net zero emission target, needs in the areas of energy network, infrastructure technologies and charging station access will be determined according to vehicle groups.
- 471.1. A roadmap will be developed for the domestic procurement of critical raw materials used in new generation energy vehicles.
- 609.1. Infrastructure and technology investments will be made for the use of electric or other alternative fuel vehicles in all modes of transportation, and harmonization and legislative arrangements for new generation, sustainable and integrated mobility services will be completed.

The Plan includes the following policies and measures regarding energy efficiency in the transportation sector:

- In order to minimize environmental impacts and costs and increase energy efficiency in the transportation and logistics sector, priority will be given to rail and maritime transportation, alternative financing methods will be enhanced, a safe, uninterrupted, efficient, integrated and sustainable transportation network and logistics centers will be established.
- Green port practices will continue to be supported by encouraging the use of low emission/non-emission producing machinery and equipment in order to increase energy efficiency in port operations and minimize environmental impacts.

Türkiye's **National Transport and Logistics Master Plan 2053 (NTLMP)**[181] sets the vision of "*being a global leader and a leading country in its region in transportation and logistics that support environment-oriented, cost-effective, safe, balanced interregional, sustainable mobility, multi-modal transportation, production, and export-oriented economic growth.*" Comprehensive environmental, clean energy and alternative fuel policy constitute the main

[181] MoTI, 2022_a.

policy framework that provides input to all modes of transport in evaluating and defining specific policy measures and recommendations selected in the NTLMP. One of the six objectives defined in NTLMP is "ensuring environmental awareness and increasing energy efficiency in transportation and logistics" to protect natural, cultural and historical assets and the environment within the scope of transportation and logistics investments and activities, to take measures against climate change, to increase energy efficiency, to act within the framework of international measures (EU White Paper, Paris Climate Agreement, European Green Consensus, European Climate Law, etc.) and to develop and maintain green transportation and green logistics investments and practices. Concerning this objective, five targets are defined as follows:

Target 1: Renewable energy production and consumption will be encouraged to increase energy efficiency in the transportation and logistics sector.

Target 2: By reducing the dependency on oil in transportation, the level of cost-oriented energy efficiency will be increased and the most appropriate balance between modes will be reached in terms of environmental sensitivity.

Target 3: The "Polluter Pays" principle will be applied so that the negative environmental effects are met by those who create this negativity based on fair and transparent criteria.

Target 4: In passenger and freight transportation, negative environmental effects will be reduced by focusing on green terminal/building (airport, seaport, dry port, railway, airline and road terminal) projects and applications and by transforming the existing ones within this scope.

Target 5: While developing transportation infrastructure, natural, agricultural, cultural assets and areas will be protected.

Green (Sustainable) Scenario of NTLMP which aims to reduce emissions by decreasing the road share and increasing the share of rail transport in passenger and freight transportation in addition to the public investment program, was chosen as a based scenario in TLMP. The base year of the model is 2019, and the years 2023, 2029, 2035 and 2053 are determined as projection years. According to the Green (Sustainable) Scenario;

- It is planned to construct a total of 8,554 km of railway lines, including 6,425 km of rapid rail lines, 1,474 km of conventional rail lines, 393 km of high-speed rail lines and 262 km of very high-speed rail lines, until 2053.

- The number of provinces with High-Speed Train and High-Speed Train connections will be increased from 11 to 52.
- The share of railways in freight transportation will increase from 5.08% in 2023 to 21.93% in 2053.
- It is predicted that the share of railways in passenger transportation, which was 0.96% in 2023, will also increase to 6.20% in 2053.
- In addition, the annual freight transport ratio of road transport will be reduced from 71.39% (2023) to 57.47% (2053).
- A sustainable, liberalized, economically profitable, high-technology railway sector will be developed, and 35% of the total energy need will be met from renewable energy sources.
- Electricity and alternative energy use will be increased instead of fossil fuels on highways, and appropriate infrastructures will be created for electric vehicles.
- In the maritime projects, it is targeted that the Green Port applications will be expanded, and highly renewable energy resources will be used in our ports.
- Environmentally friendly bio-fuels and/or synthetic fuels will be produced in airline transportation.
- Emission monitoring, reporting, verification infrastructure will be established, and carbon emissions will be strategically managed.

The National Intelligent Transportation Systems Strategy Document and **2020-2023 Action Plan** is one of the key policy documents in the transport sector.[182] ITS are developed for the purposes of reducing travel times, increasing traffic safety, using existing road capacities effectively and efficiently, increasing mobility, contributing to the national economy by providing energy efficiency, and reducing the damage to the environment. ITS use information and communication technologies in monitoring, measurement, analysis and control processes performed with versatile data exchange (between user-vehicle-infrastructure-center). ITS vision of Türkiye is determined as «A human and environment-oriented transportation system in Türkiye built with advanced information technologies», and mission of the ITS is determined as «To create a

[182] MoTI, 2020. National Intelligent Transportation Systems Strategy Document and 2020-2023 Action Plan was published in the Official Gazette No. 31204 on 5 August 2020, and entered into force with the Presidential Circular No. 2020/9. Its predecessor was **The National Intelligent Transportation Systems Strategy Document (2014-2023)** and its annex **Action Plan (2014-2016)**, which is the first in the field of intelligent transportation systems (ITS) in Türkiye.

sustainable, productive, safe, efficient, innovative, dynamic, environment-friendly intelligent transport network which creates added value and integrated with all transport modes using latest technology while making use of natural resources». Three of the Five Strategic Goals are included in the document in accordance with ITS vision and mission in accordance with climate change:

Strategic Goal-1: Development of the ITS Infrastructure
Strategic Goal-2: Ensuring Sustainable Smart Mobility
Strategic Goal-4: Creating a Livable Environment and Conscious Society

In the Strategy Document and Action Plan, 31 actions and 54 implementation steps are included along with the near-term goals of Türkiye in the field of ITS.

The MoTI also kicked off a new project funded by the EU titled "Türkiye's Net Zero Emission Target: Road Map for Transport" recently to prepare a comprehensive zero emission transition road map until 2053 covering road, urban mobility, aviation, maritime and railway transport. By this project it is aimed to prepare an actionable road map with concrete policy targets/strategies and solutions/actions, key performance indicators which will serve as integrated guidance on how to achieve net zero target in transport.

Table 24 contains Türkiye's transport sector policies and measures for reducing the Country's greenhouse gas emissions. Following the table, each policy/measure is described in the following subsections.

Table 24 – Transport sector policies and measures

PaM	Sector(s) affected	GHG(s) affected	Objective and/or activity affected	Type of instrument	Status	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact *(not cumulative, in kt CO2 eq.)* ***2030***
1 - Modal shift to public transport	Transport	CO2	Increasing low-carbon transport modes share in public transport	Infrastructure Development	Implemented	2006	MoTI	NE
2 - Strengthening Railway	Transport	CO2	Increasing the share of railways in passenger and freight transport	Infrastructure Development	Implemented	2006	MoTI	NE
3 - Blending Ethanol to Gasoline Types	Transport	CO2, N2O, CH4	Decreasing GHG emissions through increase in combustion efficiency in gasoline burning vehicles	Regulatory	Implemented	2012	EMRA, MENR, MoTI, MoEUCC	NE
4 - Blending Biodiesel in Diesel Types	Transport	CO2, N2O, CH4	Increasing share of biofuels use in diesel vehicles	Regulatory	Implemented	2017	EMRA, MENR, MoTI, MoEUCC	NE
5 - Promotion of electric and hybrid vehicles	Transport	CO2	Promotion of vehicles with alternative fuel types (including electric and hybrid vehicles), through fiscal incentives	Fiscal	Implemented	2018	MoTF, MoTI, MoEUCC	NE

6 - Electric Vehicles Fast Charging Stations Support Program	Transport	CO2, N2O, CH4	Increasing number of electric vehicles charging stations. To establish a free market with an adequate and sustainable electric vehicle charging infrastructure.	Fiscal, Regulatory	Implemented	2022	MoIT, EMRA	NE
7 - Decreasing the emissions from road transport in freight transport	Transport	CO2	Decreasing Türkiye's transport emissions by converting road transport freight to emission-efficient railway and seaway transport modes.	Infrastructure Development	Adopted	2022	MoTI	NE
8 - Regulation on Transferring Cargoes Carried by Road to Sea	Transport	CO2	Decreasing Türkiye's transport emissions by converting road transport freight to emission-efficient railway and seaway transport modes.	Regulatory	Adopted	2022	MoTI	NE
9 - Encouraging Combined Transport	Transport	CO2						
10 - ILBANK & MoEUCC Grant Programme	Transport	CO2	Supporting municipalities for the construction of bicycle lanes, green walking trails, environment-friendly streets and noise barriers.	Fiscal	Implemented	2018	MoEUCC, ILBANK	NE

11 - Green Ports	Transport	CO2	Promoting modern, cost-efficient and environmentally friendly port facilities.	Economic, regulatory, other	Implemented	2013	MoTI	NE
12 - Renewal of the Turkish Marine Fleet	Transport	CO2	Promotion of energy efficient ships through renewal of Coaster fleet	Regulatory	Planned	2021	MoTI	NE
13 – Mitigation of Airport Emissions	Transport	CO2	Airport Carbon Accreditation Programme	Regulatory, economic		2009 & 2020	MoTI, General Directorate of State Airports Authority	NE
14 - Monitoring and Pricing GHG Emissions from Ships Calling Turkish Ports	Transport							

4.2.4.1 Modal shift to public transport

The MoTI carries out projects to increase **public transportation**. It is aimed that railway system projects will provide benefits in socio-cultural, tourism, economic, ecological, and trade areas as well as the need for transportation to Türkiye. For this purpose, the Directorate General of Infrastructure Investments completed seven rail system infrastructure investments in Istanbul, Ankara, and Antalya. An additional 12 rail system projects are under construction in 6 cities.

Türkiye has also issued a **By-law on Electric Scooters**, covering multiple areas in relation to the use of e-scooters in public areas, such as e-scooter applications, authorization of operators, and major safety rules will contribute to the modal shift towards shared mobility. The By-law was prepared by the joint work of the MoTI, MoEUCC, and the Ministry of Interior and entered into force in April 2021. The by-law includes the regulations regarding the shared electric scooter (e-scooter) business activities.

The General Directorate of Highways has completed the construction of a 68.02 km long bicycle path in 16 provinces, and the construction of a 40.55 km long bicycle path in 8 provinces continues. In addition, the project works of the 155.80 km long bicycle path in 14 provinces have been completed, and the project studies of the 188.87 km-long bicycle path in 15 projects in 12 provinces are continuing.

The **Mobility Hub Design Guide** was prepared by the MoTI which defines mobility hub typologies, components and guides metropolitan municipalities on how to implement hubs in their cities to provide modal shift towards public transport and sustainable modes in urban areas.

The **Mobility Vehicles and Technologies Roadmap**, which the Ministry of Industry issued in 2022, includes the roadmap of Türkiye in transition to zero emissions in different transport modes.

The **By-Law on Combined Transport**[183] aimed to establish and expand an environmentally friendly and sustainable transportation system by setting out the principles regarding all elements of **green logistics activities** (such as combined transportation, energy efficiency, greenhouse gas management, and green packaging). In this context, it has been stated that businesses holding a 'Green Logistics Certificate' that continue their combined transportation and green logistics activities will be given additional points in their applications for the UBAK

[183] The Official Gazette dated 27.05.2022 and numbered 31848.

Permit, with various reductions in the Authorization Certificate, Activity Certificate, and Vehicle Card fees that are given by the Ministry of Transport and Infrastructure. In addition, among the enterprises that provide continuity in green logistics activities, those who are found suitable according to the procedures and principles to be prepared and published by the MoTI will be entitled to receive the **Green Logistics Award**.

4.2.4.2 Strengthening Railway

Türkiye carried out railway construction and renovation, signaling, and electrification works to strengthen **railway transport** in the Country. In rail transport, the total railway length reached 13,919 km, including a 2,251 km fast train railway by 2023. With the implementation of the NTLMP, Türkiye aims to increase the share of railways in freight transport from 5.08% to 20.12% and the percentage of railways in passenger transport from 0.96% to 5.31% by 2035. Türkiye further aims to increase the share of railways in freight transport to 21.93% and the share of railways in passenger transport to 6.20% by 2053. Moreover, Türkiye targets to cover 35% of the total energy need of railways from renewable energy sources. In this context, the Directorate General of Turkish State Railways Energy Management and Climate Change Action Plan (2023-2025), which consists of 9 goals, 20 targets, and 82 actions, with 3 themes: "Green Transportation on the Railroad", "Zero Carbon Future" and "Reliable Energy Supply", was put into effect.

4.2.4.3 Blending Ethanol to Gasoline Types

Communique on Blending Ethanol to Gasoline Types came into force in 2012. The By-law aims decreasing GHG emissions through increase in combustion efficiency in gasoline burning vehicles. This legislation introduced the obligation for licensed distributors to blend at least 3% (v/v) of ethanol from domestic agricultural products/waste into gasoline types imported and supplied from refineries.

4.2.4.4 Blending Biodiesel in Diesel Types

Communique on Blending Biodiesel in Diesel Types came into force in 2017. The By-law aims decreasing GHG emissions through increase in combustion efficiency in diesel vehicles. This legislation introduced the obligation for licensed distributors to blend at least 0.5% (v/v) biodiesel from domestic agricultural products/waste into diesel types imported and supplied from refineries.

4.2.4.5 Promotion of Electric and Hybrid Vehicles

Türkiye has been increasing its efforts to promote the adoption of electric vehicles as part of its broader strategy to reduce GHG emissions and dependence on fossil

fuels. The total number of EV sale and charging sockets in the country increased over 300% compared to the prior year. MoTI also prepared its plan to determine EV charging station locations based on the charging demand on highways for the future which is the key to increase the EV adoption.

Türkiye regards the proliferation of electric vehicles as a strategic goal. The spread of electric cars will be a lever for developing the primary industry, supply industry, and technology ecosystem that creates value-added products and services in this newly developing field. **Türkiye's Automobile Initiative Group Industry and Trade Inc. (TOGG)** was established on June 25, 2018, to produce electric cars.

Türkiye revised the tax regulations and reduced Special Consumption Tax (SCT) rates applied on electric and hybrid motor vehicles compared to conventional (internal combustion with high emission) motor vehicles to promote the purchase of these types of vehicles. Tax regulations to provide these incentives.

Recent developments on taxation of vehicles:

(i) With the ***Presidential Decree No. 6885 dated 2/3/2023***, the goods under the line '- Others; -- ***Only those with electric motors***' with HS Code 87.03 under the list (II) attached to the Special Consumption Tax (SCT) Law No. 4760, the threshold for SCT rates has been increased from TL 700.000 to TL 1.250.000 for those not exceeding 160 kW and from TL 750.000 to TL 1.350.000 for those exceeding 160 kW. As of 3/3/2023, vehicles below 160 kW and not exceeding TL 1.250.000 are taxed at 10% and those exceeding TL 1.250.000 at 40%; vehicles above 160 kW and not exceeding TL 1.350.000 are taxed at 50% and those exceeding TL 1.350.000 at 60%. As a result of the decision, the vehicles in the tax brackets covered by the Regulation are taxed in a lower tax bracket, thus reducing the calculated SCT amounts of these vehicles.

(ii) With the ***Presidential Decree No. 7803 dated 17/11/2023***, the SCT base threshold, which is the basis for the special consumption tax rates determined for "--- Those with an engine power not exceeding 160 kW" under the line "-Others; -- ***Only those with electric motors***" with HS Code 87.03 under the list (II) annexed to the SCT Law No. 4760, has been increased from TL 1.250.000 to TL 1.450.000. As of 18/11/2023, vehicles below 160 kW and not exceeding TL 1.450.000 are taxed at 10% and those exceeding TL 1.450.000 are taxed at 40%. As a result of the decision, vehicles not exceeding 160 kW are taxed in a lower tax bracket, thus reducing the calculated SCT amounts of these vehicles.

(iii) With the amendment made in ***Article 11 of the Law No. 7521 on the Amendment of Certain Laws and Decree Laws***, under the "- Others" line of the order of HS Code 87.03 of the list numbered (II) annexed to the Special Consumption Tax Law No. 4760, in order to ***incentivize externally rechargeable vehicles*** that also feature an electric motor; the

special consumption tax rates for the vehicles in question, whose carbon dioxide emissions per weighted combined kilometer of these vehicles are below 25 grams and whose range covered with equivalent electrical energy is 70 kilometers and above, have been determined as 30% for those whose engine cylinder volume does not exceed 1600 cm³ and whose tax base does not exceed TL 1.350.000, 60% for those exceeding TL 1.350.000, and 70% for those whose engine cylinder volume exceeds 1600 cm³ but does not exceed 1800 cm³ and whose tax base does not exceed TL 1.350.000. In this way, vehicles in the tax brackets subject to the regulation are taxed at a lower rate.

The By-Law on the Disclosure of Consumers About Fuel Economy of New Passenger Car and CO2 Emissions aims to provide enlightenment of consumers about CO2 emission and fuel economy of new passenger cars offered for sale or rent in the market in order to make consumers informed choices. Therefore, Directorate General for Industry collects and publishes fuel consumptions and emissions of new passenger cars. Within the scope of the By-Law, the market supervision of the cars is done by Directorate General for Safety and Supervision of Industrial Products.

4.2.4.6 Electric Vehicles Fast Charging Stations Support Program

Charging Service By-law entered into force in April of 2022 specifying licensing procedures, rules on operation of charging stations and prices. Within this legal framework, EMRA continues its regulatory activities to establish a free market with an adequate and sustainable electric vehicle charging infrastructure. In this respect, the number of charging network operator license holders increased to 170 as of August 2024. From the beginning of 2023 to August 2024, the number of charging stations across Türkiye increased from 1,719 to 9,206, and the number of charging points (sockets) increased from 3,081 to 22,562.

The MoTI introduced the **Charging Stations Call for Electric Vehicles**, aiming to increase the number of fast charging units in Türkiye, which requires establishing a sufficient number of stations in all provinces of the Country. With this call, it was aimed to accelerate investments by providing grant support for charging units to be established by the private sector in order to develop the charging infrastructure.

Despite the fact that electric vehicle ownership is currently concentrated in big cities, considering the projection studies, minimum access to charging infrastructure should be homogeneously distributed throughout the Country. For

this transformation, a development plan for electric vehicle charging infrastructure for Türkiye was prepared by the MoIT with the active participation of the relevant public institutions, especially the Energy Market Regulatory Authority and the Turkish Standards Institute, and the intense contribution of the private sector. As a result of the studies carried out, a legislative infrastructure has been established that will ensure the development of the ecosystem in an effective and sustainable structure, where they will provide services to all-electric vehicle users without any preconditions, under two national standards and the industry's free market conditions. The MoIT announced the program on 14 April 2022 and introduced it by reaching more than 1,000 investors with the information meetings it held. In total, 206 companies applied to the Technological Product Investment Support Program Charge Stations Call for Electric Vehicles, and 20 investors were entitled to receive firm support. As a result of the evaluations, public support of 137,492,954 TRL was provided to these 20 investor companies for the investment projects they developed with a total budget of approximately 1 billion TRL. The first phase of the process was completed by supporting the charging infrastructure support works. In this way, in the first quarter of 2023, Türkiye will have 1,572 units (3,144 sockets) of fast chargers and infrastructure distributed to all cities of Türkiye. Türkiye aims to continue providing support to more investors, and after the Programme, the Country will have 142 MW more installed fast charging infrastructure.

4.2.4.7 Decreasing the emissions from road transport in freight transport

Türkiye aims to decrease the annual freight transport ratio of road transport. With the implementation of NTLMP, annual freight transport ratio of road transport will decrease from 71.39% to 59.22% by 2035. Moreover, Türkiye aims to decrease GHG emissions from road transport by infrastructure development such as tunnel projects.

4.2.4.8 Transferring Road Cargo to Seaway

The MoTI has released a by-law that supports the transfer of cargoes from road to seaway on 9 August 2022. The main objective of this regulation is to establish the policies and guidelines for the assistance to be provided to ship owners in order to increase the proportion of maritime transport in combined transportation and to encourage the conversion of cargoes currently transported by road to maritime transport.

4.2.4.9 Encouraging Combined Transport

The MoTI has released a by-law in 2022 with the objective of extending and promoting combined transport operations and green logistics activities among the freight forwarders licensed in Türkiye. By 2024, 30 Turkish freight forwarders are rewarded with a "green logistics certificate" within the scope of the regulation. Green logistics certificate owners can benefit from the incentives below;

- 50% discount on first time applications for transport certification fees
- 50% discount for renewal fees for transport certificates
- 95% discount for vehicle card fee for 100 vehicles to be attached to the transport certificates
- Additional points for CEMT distribution
- Green logistics certified freight forwarders benefited from 2.211.889,00 TL total monetary amount of reward.

4.2.4.10 ILBANK & MoEUCC Grant Programme

A grant and support was provided to municipalities by the MoEUCC in cooperation with the İLBANK to support the construction of bicycle lanes, green walking trails, environment-friendly streets and noise barriers.

4.2.4.11 Green Ports

In order to prevent the environmental impacts and adverse effects and eliminate to a certain extent, the "Green Port" Project was developed by the Directorate General of Maritime Affairs, MoTI in 2013. Green Port project which is a voluntarily based project is focused primarily on port operations. ISPS Code Compliance Certificate, TS EN ISO 9001 Quality Management System Certificate, TS EN ISO 14001 Environmental Management System Certificate, TS 18001 occupational Health and Safety Management System Certificate and Auditor's technical report prepared by authorized organization are the main documents that figures out compliance with sectorial criteria.

Certificates are being issued to the ports that fulfil these sectoral criteria. Certificate validity period is three years. In this certificate, modern, eco-friendly and cost-efficient ideas to enhance the competitiveness and to promote Green Ports are presented by taking into account the current situation of the ports, as well as the current legislation regarding the protection of the environment.

The "Green Port" application is expected to increase the environmentally friendly port facilities and as of 2023, while 20 ports received **Green Port Certificate,** the application procedures of 6 more ports are still in progress. Ports are encouraged

for development of supply opportunities for alternative fuels, development of onshore powering/cold ironing infrastructure, establishment of renewable energy infrastructure in ports, installation of low/zero emission vehicles, handling equipment and other projects related to other structures.

The Green Port Certification Program for coastal facilities was updated and published in the Official Gazette No. 32373, dated November 18, 2023. Under the updated regulation, while the application for existing ports is voluntary, newly established coastal facilities are required to be constructed in compliance with Green Port standards.

Green Port Certificates will be issued for a period of three years. To support and promote the Green Port initiative, the following incentives will be implemented:

- The validity period of the "Coastal Facility Operating Permit" and the "Coastal Facility Dangerous Goods Conformity Certificate" will be extended by two years.
- No survey service fees will be charged for the Coastal Facility Operating Permit.
- Fees for container weighing verification services, as collected by the Ministry, will be waived.
- Discounts and exemptions will be applied to the fees payable to the Ministry's Revolving Fund for the extension or renewal of authorization certificates, licenses, and permits, as specified in the Ministry's Fee Tariffs.
- Priority passage through the Turkish Straits will be granted to up to thirty ships arriving at Green Ports within a year.

Coastal facilities aspiring to achieve Green Port status are required to comply with the following criteria:

- Obtain an energy performance certificate for buildings.
- Ensure that at least 5% of energy consumption is met through renewable energy sources.
- Ensure that at least 50% of the primary handling equipment, in terms of number or energy consumption, is powered by electric energy.
- Conduct annual exhaust emission measurements for vehicles and, if increases are observed, implement measures to reduce emissions to below initial measurement levels.
- Provide electrical connections for ships at a minimum of one terminal, berth, or pier.
- Establish a Zero Waste Management System.

- Install water-oil separators at water discharge points and utilize rainwater collected from building roofs.
- Maintain at least 50% more barriers and oil-absorbing materials on-site than the minimum quantities required under the Emergency Response Plan.
- Establish a commemorative forest on behalf of the coastal facility.
- Install at least two waste collection devices within the port area to collect marine litter without obstructing maritime traffic.
- Conduct coastal clean-up operations on at least two beaches designated by the coastal facility each year.
- Install a minimum of two vehicle charging units in the coastal facility parking area.

Coastal facilities seeking certification must comply with these criteria and other provisions outlined in the regulation and submit their applications to the Directorate General of Maritime Affairs.

4.2.4.12 Renewal of the Turkish Marine Fleet

Türkiye also plans to support the construction of new ships and retrofitting of existing ships for a low-carbon, energy and fuel-efficient maritime fleet. Ships powered by LNG, battery/electrification, methanol, green hydrogen and ammonia will be priority tasks.

The **By-Law on Recreational Craft and Personal Watercraft** entered into force in May 2017, in accordance with the EU Directive 2013/53/EU on Recreational Craft and Personal Watercraft. The By-Law aims to limit carbon, nitrogen oxides and hydrocarbons ratios in the exhaust emissions of the personal watercraft engines.

Türkiye aims to establish **financial support mechanisms** for innovative technologies to be used for environmentally friendly, sustainable and safe transportation on the ships and ports. For the renewal of the merchant marine fleet, Türkiye started a programme designed to support ships between 1000 GT and 5000 GT. The scope has been expanded to include ships larger than 50 GT. In addition, the number of ships that will benefit from the incentive has been increased from 5 to 10 annually. In addition, the amount of support to be given for conventional ships to be built to replace the scrapped ship has been increased by 50 percent, from 1 time the scrap price per ton to 1.5 times. The amount of support has been boosted 2.5 times the price of scrap per ton if an alternative environmentally friendly energy source, such as LNG or hybrid systems, is installed on the newly constructed ship. For the ships that will convert the main engines of existing ships from fossil fuel to an alternative environmentally friendly energy source, a grant of 25 percent of

the conversion cost will be provided. The MoTI submitted the **Maritime Decarbonization and Green Shipping Project** to the EU commission as part of the IPA program. The project has been developed to encourage the use of innovative, and environmentally friendly technologies in ports and ships and create a sustainable environment for further investments in the sector. Basically, the project has three main outputs. The first is to support the transition to a low-carbon, energy and fuel-efficient maritime fleet. The second is to develop the bunker of alternative fuel infrastructure such as LNG, Bio-LNG, Methanol, Hydrogen or Ammonia. The final output of the project is to use the establishment of port electricity infrastructures in port facilities and the use of sustainable energy. With the mechanism to be established, approximately 20 million Euros in grant and 50 million Euros of long-term cost-effective loan support will be provided to maritime sector by the European Bank for Reconstruction and Development (EBRD).

4.2.4.13 Mitigation of Airport Emissions

Türkiye's **Nationally Determined Contribution** frames GHG emission reduction policies as "Implementing green port and green airport projects to ensure energy efficiency".

In 2020, DHMI launched the ***Carbon-Free Airport Project*** to ensure sustainable airport operations. With the project, all environmental aspects such as solid waste, wastewater, noise, greenhouse gas and climate change generated within the scope of airport activities are managed. Within the scope of the project, 50 airports have been certified at different levels in the ***Airport Carbon Accreditation Programme***. It is aimed to certify all airports. DHMI has become a party to the Toulouse Declaration signed with the aim of reaching net zero CO2 emissions by 2050 in Europe and the Net Zero CO2 emissions (scope 1 & 2) by 2050 programs initiated by Airport Council International (ACI) Europe. Roadmaps for emission reduction have been prepared and submitted to ACI Europe.

Green Airport Project was launched by Directorate General of Civil Aviation and has put into implementation in 2009 and have been improved year by year. In the scope of The Green Airport Project, 170 companies achieved to obtain Green Company Certificate and 6 airports (Uşak, Tokat, Adana, Balıkesir, Siirt and Erzincan Airports) succeeded to have Green Airport Certificate as of 2020. If a company achieves to get a Green Company Certificate, it gains 20% reduction on company license renewal fee. If an airport achieves to get a Green Airport certificate, all the companies have the 50% reduction on company license renewal. A new legislation entitled **Environmental Management Directive at**

Airports was developed and sent to the Ministry of Transport and Infrastructure. This legislation will cover all actions taken by the Green Airport Project. Aim of the legislation is to set environmental standard and emission monitoring at all airports in the Türkiye.

4.2.4.14 Monitoring and Pricing GHG Emissions from Ships Calling Turkish Ports

As part of EU's Green Deal strategies, it was decided in 2022 to include emissions from the maritime sector in the EU Emissions Trading System (EU ETS). The relevant legislation (Directive (EU) 2023/959) was adopted by the European Commission on April 25, 2023, came into effect on June 5, 2023, and has been in application since January 1, 2024.[184]

To maintain operational continuity and competitiveness of the Turkish-flagged and Turkish-owned merchant fleet, there is a pressing need to rapidly reduce GHG emissions. Significant investments are required for both retrofitting existing vessels and developing alternative fuel infrastructure in ports. It is crucial for Türkiye to utilize the revenues collected from international and regional carbon pricing mechanisms in the most efficient and effective manner.

In this context, Article 3 of the Law No. 7519, published in the Official Gazette No. 32597, which amends the Turkish Civil Aviation Law and various other laws as well as Decree Law No. 655, provides a framework for pricing greenhouse gas emissions produced by ships arriving at and departing from Turkish ports. The revenues generated from this legislation will be allocated as a special appropriation in the budget of the Ministry of Transport and Infrastructure, to support research, development, transformation, and new construction activities aimed at promoting green maritime practices. To ensure effective implementation of the law, the necessary technical and regulatory infrastructure for monitoring, verification, and reporting of greenhouse gas emissions produced by ships arriving at and departing from Turkish ports is being established.

[184] Under this regulation, 100% of the revenues generated from emissions produced by ships departing from a port within the jurisdiction of an EU Member State and arriving at another port under the jurisdiction of an EU Member State, as well as emissions from ships docked at or engaged in any activity within an EU Member State port, are subject to EU ETS pricing. Additionally, 50% of the revenues from emissions generated by ships traveling between a port under the jurisdiction of an EU Member State and a port outside the European Economic Area (EEA), or vice versa, are also subject to EU ETS pricing. The EU ETS regulation allows the remaining 50% of the revenue from emissions generated on voyages between EEA ports and ports outside the EEA to be retained by the non-EEA country concerned.

4.2.5 INDUSTRY, INDUSTRIAL PROCESSES AND PRODUCT USE

Overview

The "Green Deal Action Plan" of Türkiye including a total of 32 objectives and 81 actions under 9 main headings is the main document regarding the policies impacting manufacturing industry of Türkiye in relation to climate change. The Action Plan includes measures for harmonizing with the EU's Green Deal, especially in areas related to trade and industry. Besides Türkiye's policies and measures which will harmonize the EU Green Deal to Türkiye, the EU Green Deal itself directly impacts Turkish industries and their trade to the EU. Also, in line with 2053 net zero emission target, studies to determine sectoral road maps completed and publicly announced in cooperation with the European Bank for Reconstruction and Development (EBRD). Executed projects are:

- A Low Carbon Roadmap for the Steel Sector in the Republic of Türkiye
- A Low Carbon Roadmap for the Aluminum Sector in the Republic of Türkiye
- A Low Carbon Roadmap for the Cement Sector in the Republic of Türkiye
- A Low Carbon Roadmap for the Fertilizer Sector in the Republic of Türkiye

Within the scope of the studies; scenarios were developed in which the necessary technologies, additional investments and policy steps were determined on a sectoral basis to ensure green transformation and reduce carbon emissions, and the carbon emission expectation for each of these scenarios was modeled and quantified. After evaluating the results of the study, the policy steps to be taken, investment needs and technology options were reported under a road map.

The **Industry and Technology Strategy for 2023** was published on 18 September 2019.[185] The strategy aims to reduce the effects of industrial production on the environment.[186] For this purpose, it foresees continuation of supports to technology-intensive modernization of infrastructure and enterprises and new investments based on clean production, especially in organized industrial zones. It is planned that an Industry Registry Information System will be developed to establish an "Economically Valuable Waste Monitoring System" within the scope of the circular economy policies. MoIT and MoEUCC will cooperate in order to use

[185] MoIT, 2019. The Strategy is a road map in realizing Türkiye's "National Technology, Powerful Industry" vision. The Strategy has five main components: (i) High Technology and Innovation, (ii) Digital Transformation and Industry Move, (iii) Entrepreneurship, (iv) Human Capital, and (iv) Infrastructure. The Strategy is expected to support Türkiye's 2023 targets in the fields of industry and technology.

[186] MoIT, 2019.

environmental contribution revenues to finance the investments of manufacturers for the development of environmental protection and waste management systems and practices. In addition, the MoEUCC, MoIT, and municipalities will work in coordination with the Ministry of Industry and Technology while determining industrial zones and industrial areas.

"Türkiye Green Industry Project" is being implemented with the support of the World Bank to promote sustainable green transition in Türkiye, with a total budget of USD 450 million. The main executing partner of the project is the MoIT, while the other partners are KOSGEB and TÜBİTAK, which are related organizations of the Ministry.

Under the technical assistance component, the Ministry is carrying out technical assistance and capacity building activities related to green transition with a budget of USD 25 million. Under this component, preparations for the technical specifications of the service procurement for the preparation of the "Green Transition Roadmap Report", which will be the input for the Green Transition Support Program of the enterprises, are ongoing. In addition, preparations are being made for trainings in the field of green transition for project partners.

With the 250 million USD credit allocated for KOSGEB for the green transition activities of SMEs, the activities of industrial enterprises in thematic areas such as renewable energy, resource efficiency, waste management, circular economy, sustainability, etc. are supported. Within the scope of the Green Industry Support Program launched on December 8, **2023, a total of 1,338 business applications, 648 for "2023.01- Call for Proposals for Supporting Solar Energy Investments of Industrial SMEs"** and **690 for "2023.02- Call for Proposals for Clean and Circular Economy in Industry"**, have been approved and applications are still being received until November 30, 2024. The evaluation of the received applications started on 14.03.2024 by the Independent Evaluation Board. **Support payments of 565,538,297.00 TL were made to 226 enterprises** whose projects were accepted until 14.08.2024.

TUBITAK supports all companies engaged in green innovation activities involving the development of new green technologies, products or processes with a loan of USD 175 million allocated to projects related to green transformation. Initiated in this context;

- Within the scope of **"1831- Green Innovation Technology Mentoring Support"**, 25 organizations have been identified as Solution Partners. "1831

- Green Innovation Technology Mentoring Call" was opened on 17.05.2024 for SMEs to apply and 52 applications have been received so far.
- Within the scope of **"1832 - Green Transformation Support in Industry"**, 3 calls were opened with the code 1832 2023, 1832 2024-1 and 1832 2024-2. A total of 236 project proposals with a total budget of 2.650.254.947 TL have been received and the evaluation processes are ongoing.
- Within the scope of **"1833 - SAYEM Green Transformation Support"**, 15 applications with a total budget of 2.291.989.526 TL were received in 3 calls opened with the code 1833 2023, code 1833 2024-1 and code 1833 2024-2, and project evaluation processes are ongoing.

Green Organized Industrial Zones are an important initiative. "Green solutions are used to address the fundamental infrastructure and superstructure of Organized Industrial Zones (OIZ) as part of the World Bank initiative. The project portfolio includes infrastructure such as water, storm water and sewage pipelines, electricity and natural gas networks, roads etc., wastewater treatment plant, wastewater reclamation and reuse plant, solar power plant (SPP), administrative building, zero waste and biogas plant constructions respectively."

Green Organized Certification System will play a vital role for OIZs to monitor their economic, environmental, social and governmental performance. MoIT evaluates OIZ's performance in two stages in cooperation with TSE. For first stage, MoIT determined 6 pre-criteria and started to evaluate compliance of applications from December, 2022. After this process, TSE will start to score OIZ's performance in 2023 within the framework of economic, environmental, social and governmental indicators and give certificate in four level such as platinum, gold, silver and bronze.

The Energy Efficiency 2030 Strategy and 2nd National Energy Efficiency Action Plan (2024-2030) impacts industrial emissions. With these documents, it is aimed to reduce the amount of energy consumed per GDP (energy intensity) of Türkiye by at least 15% compared to the 2023 level. The Strategy aims to develop the regulatory framework for energy efficiency and increasing the effectiveness of incentives. Necessary measures determined as a result of periodic energy audits in energy-consuming companies, determination of energy saving potential and costs, and preparation of action plans for applications are included. 2nd NEEAP also has targets regarding the industry sector.

National Eco-Efficiency Programme, which has been initiated within the framework of Turkish Industrial Strategy Document and Action Plan (2015-2018), aims to direct Turkish Industry towards more environmentally friendly practices

through several activities such as awareness raising on concepts including but not limited to eco-efficiency and cleaner production, increasing cooperation among institutions and businesses, capacity building, providing technical and financial support to businesses.

The MENR plans legislative arrangements which would aim to promote renewable power generation and use in the manufacturing industry.

Table 25 contains Türkiye's manufacturing industry and IPPU sector policies and measures for reducing the Country's greenhouse gas emissions. Following the table, each policy/measure is described in the following subsections.

Table 25 – Manufacturing industry, industrial process and product use sector policies and measures

PaM	Sector(s) affected	GHG(s) affected	Objective and/or activity affected	Type of instrument	Status	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact *(not cumulative, in kt CO2 eq.)* ***2030***
1 - Grant Programme for Energy Efficiency Improvement Projects and VAs	Industry / Industrial Processes and Product Use	CO2	Provision of financial support for industrial enterprises that reduce energy usage %15 to improve energy efficiency in industrial sector	Economic, regulatory	Implemented	2009	MENR, MoIT	NE
2 - Promotion of renewable electricity use in industry	Industry / Industrial Processes and Product Use	CO2	Promoting renewable power generation and use in manufacturing industry	Economic, regulatory	Implemented	2015	MENR, MoIT	NE
3 - Promotion of Waste-Derived Fuels	Industry / Industrial Processes and Product Use	CO2, CH4	Decreasing GHG emissions of manufacturing industries by replacing fossil fuel consumption with waste-derived fuels	Regulatory	Implemented	2014	MoEUCC	NE
4 - Promotion of ISO 50001	Industry / Industrial Processes and Product Use	CO2	Increasing energy efficiency at manufacturing industries	Regulatory	Implemented	2018	MENR, MoIT, TSE	NE

5 - Supporting Sustainable Energy Project Implementations of SMEs	Industry / Industrial Processes and Product Use	All gases	Provision of support for SMEs that implement sustainable energy projects that reduce GHG emissions	Economic, other	Implemented	2015	MENR, MoIT, KOSGEB	NE
6 - Reducing F-Gas Emissions	Industry / Industrial Processes and Product Use	F-gases	Decreasing F-gas emissions	Regulatory	Adopted	2022	DOCC, MoEUCC	NE
7 - Development of low-carbon technology roadmaps in manufacturing industries	Industry / Industrial Processes and Product Use	All gases	Identifying the technological needs of industrial sectors regarding Türkiye's green development goals and formulating solutions	Research	Adopted	2022	MoIT, TUBITAK	NE

4.2.5.1 Grant Programme for Energy Efficiency Improvement Projects and VAs

Grant Programme for Energy Efficiency Improvement Projects and VAs have been implemented to motivate industrial companies since 2009. Certain amounts have been allocated to the MENR's annual budget for incentivizing industrial establishments. Within the amendment in the Energy Efficiency Law in 2021[187], energy efficiency project supports have been expanded to cover the building, agriculture and service sectors as well as the industrial sector.

The Voluntary Agreements have been implemented to motivate companies to achieve a minimum of 10% decrease in energy intensity over a three-year period. Also rate of the support was increased from 200 thousand TL to 1 m TL and the energy support ratio increased from 20% to 30% as of 2019. In case a company meets the target set by the agreement, then up to 30% instead of 20% of the energy costs can be granted during the first year. The maximum amount is changed to 1 million TL.

Within the scope of Voluntary Agreements (VAs) between 2017-2021, one industrial enterprise has completed a project with a total of TL 3 million investment of which TL 0.2 million has been granted by MENR. Energy savings from this agreement is 934 toe/year and the monetary saving is TL 1.6 million.

Within the grant incentives such as value added tax exemption[188], customs duty exemption, tax reduction, employer's insurance premium support, interest support and investment location allocation are given to investments of manufacturing industry plants that save 15% energy compared to the current situation. Plants benefiting from these incentives invested $25 million for energy efficiency projects and reduced 440 thousand tons of carbon emissions.

4.2.5.2 Promotion of Renewable Electricity Use in Manufacturing Industry

Since 2015, Türkiye is supporting renewable electricity use in the manufacturing industry.

4.2.5.3 Promotion of Waste-Derived Fuels

By-law on Waste Incineration introduced co-incineration facilities and alternative fuels to the Turkish legislation.[189] Following the commencement of the by-law, usage of waste-derived fuels such as **Refuse Derived Fuels (RDF)** and **Solid**

[187] The Law No 7346 published in the Official Gazette No. 31700 of 21 December 2021

[188] Value - added tax exemption is introduced for the construction of facilities and purchases of new machinery and equipment for the manufacturing industry.

[189] Official Gazette dated 6 October 2010 numbered 27721

Recovered Fuels (SRF) increased in the manufacturing industry, especially in cement production plants. Some cement plants have waste incineration license which is given by MoEUCC. They use waste as alternative fuels and also raw material. Wastes co-incinerated by license are: waste plastics, used tires, waste oils, industrial sludge, tank bottom sludge and sewage sludge, etc. Ratio of secondary fuel to total fuel consumption in cement industry increased from 4.47% in 2017 to 7.97% in 2021. The **Climate Council** that was held in 2022 in Türkiye suggested to further increase the production and usage of waste-derived fuel for emission reduction and foresees the joint work of the relevant ministries, municipalities and industrial facilities for this purpose.

4.2.5.4 Promotion of ISO 50001

ISO 50001 certification is mandatory for companies that apply for energy efficiency supports. Companies under this scheme are obliged to set up an energy management unit and/or appoint an energy manager.

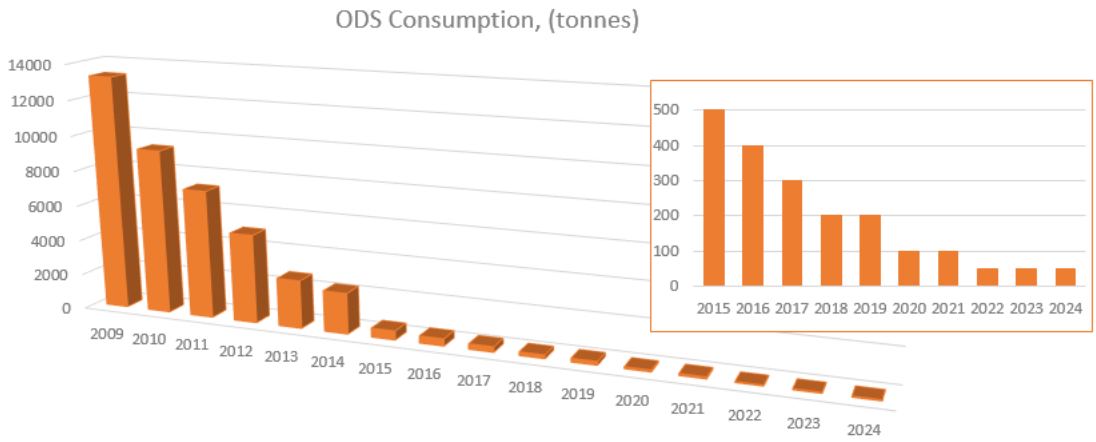
4.2.5.5 Supporting Sustainable Energy Project Implementations of SMEs

In promoting the adoption of higher efficiency motors by Small and Medium Sized Enterprises (SMEs) is being implemented under the Ministry of Industry and Technology (MoIT) with financial support of Global Environment Facility (GEF) and in cooperation with UNDP with the **Promoting Energy-Efficient Motors in Small and Medium Sized Enterprises (SMEs) in Turkey Project** (known as TEVMOT Project) which is a 6 year duration between 2017-2023 and aims to promote significant additional investment in industrial energy efficiency in Türkiye by transforming the market for energy-efficient motors used in SMEs.

4.2.5.6 Reducing F-Gases Emissions

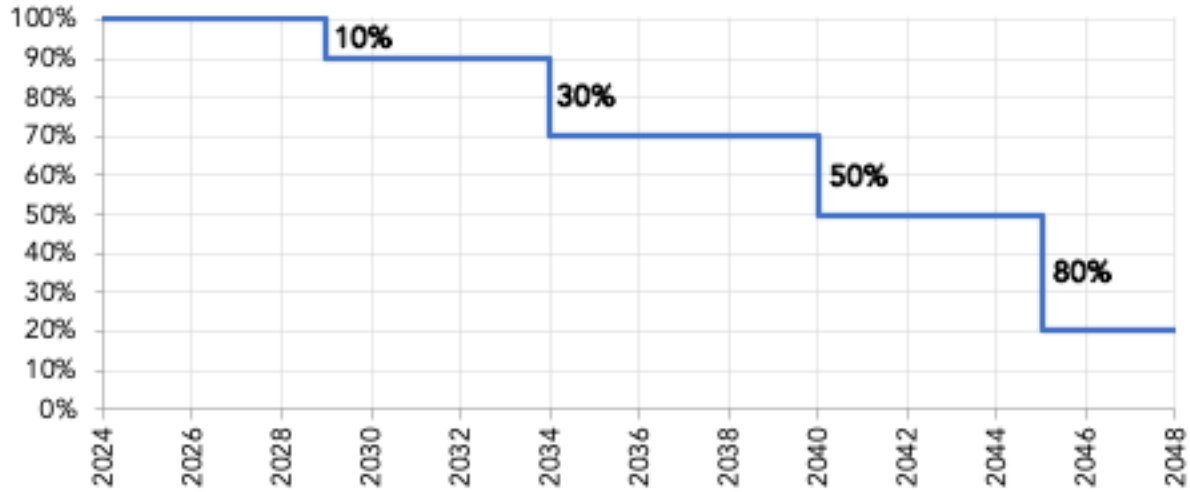
Türkiye is a party to the Montreal Protocol on Substances that Deplete the Ozone Layer as an Article-5 (A-5, developing) Group 1 country. Türkiye has successfully completed the necessary legislative preparations to phase out Ozone Depleting Substances (ODSs). Under the phase-out program implemented within the framework of the Montreal Protocol, the import amount of ODSs was reduced from 13,200 tons in 2009 to 200 tons in 2019, 100 tons in 2020 and 2021, and 50 tons in 2022, 2023, and 2024. Türkiye will phase out hydrochlorofluorocarbons (HCFCs) as ODSs by January 1, 2025. (Figure 65)

Figure 65 - Phasing Out Schedules for Ozone Depleting Substances (ODS) Consumption



With the ratification of the Kigali Amendment, as of 2021, phasing down schedules for hydrofluorocarbon (HFC) consumption for the next decades have been established. Within this scope, the phasing down of HFC consumption has begun, with the target of achieving the first 10% reduction by 2029 and an 80% reduction in HFC consumption by 2045. (Figure 66)

Figure 66- Phasing Down Schedules for Hydrofluorocarbon (HFC) Consumption



A reduction of HFCs as planned substantially impacts Türkiye's GHG emissions and shows the country's interest in promoting synergies between the Paris Agreement and the Kigali Amendment. On the scope of the Kigali Amendment, The Kigali Implementation Plan, which will be taken as a baseline of national strategy for the phasing down of HFCs, has been prepared by 2024.

Türkiye currently has a successfully implemented By-law on Fluorinated Greenhouse Gases. Under this regulation, provisions for labeling, databases, leakage checks, reporting, license and quota allocation, and recovery, recycling, reclaimation and disposal of HFCs in aligned with the HFC phase-down schedule have been put into effect, alongside measures to control the release of these high global warming potential f-gases. It also includes regulations for the training and certification of individuals and companies involved in handling equipment containing these gases. The By-law specially addresses the evaluation of refrigeration, air conditioning, heat pump, fire protection, electrical switchgear, refrigerated trucks and trailers, aerosols, and solvents containing fluorinated greenhouse gases. Türkiye began phase-down HFC consumption as of 2024. As of May 10, 2023, licensing system has been introduced for the imports and exports of HFCs, and since 2024, a quota system has been implemented for the import of bulk HFC. Türkiye currently implementing projects to strengthen its capacity on HCFCs and HFCs.

4.2.5.7 Development of Low-Carbon Technology Roadmaps in Manufacturing Industries

The MoIT and TUBITAK developed low-carbon technology roadmaps for Türkiye's manufacturing industries, including the iron-steel, aluminum, cement, chemicals, plastics, and fertilizer sectors, as part of the Green Deal Action Plan. Based on the results of these studies, investment support programs were designed in cooperation by the MoIT and TUBITAK. By the end of this study, the technological needs of the sectors regarding green growth revealed, and R&D and innovation support areas will be created to address them.

4.2.6 AGRICULTURE

Overview

Türkiye's first **Nationally Determined Contribution** suggests the following measures for reducing GHG emissions in the agriculture sector:

- Fuel savings by land consolidation in agricultural areas
- Rehabilitation of grazing lands
- Controlling the use of fertilizers and implementing modern agricultural practices
- Supporting the minimum tillage methods

Several strategy documents and plans of the Ministry of Agriculture and Forestry (former Ministry of Food, Agriculture and Livestock) underline the threat of climate

change's impacts on agricultural production and the security of food supply. Therefore, over the last decade, strategies, policies, and plans in the agriculture sector have included conducting vulnerability assessments on agricultural products, together with financial support schemes for farmers who have economic losses due to the impacts of climate change. Thus, the level of policies and measures regarding reducing GHG emissions from the agricultural sector can be considered as less advanced compared to measures to adapt to the impacts of climate change. However, many policies and measures that have impacts to increase climate change resilience of the agriculture sector also have GHG emission mitigation impacts. The following policy documents include several measures that target both reduction of GHG emissions and increasing resilience to the impacts of climate change in the agriculture sector:

Strategic Plan (2019-2023) of Ministry of Agriculture and Forestry suggests R&D studies to be performed to increase the agricultural production efficiency and quality, where "the number of model/suggestion/systems developed to ensure emission measure, monitoring and mitigation" is considered as one of the performance indicators. In addition, two important strategies have been determined in this area. First, it focuses on adapting to the effects of climate change on agriculture and determining agricultural drought studies will be carried out. Latter, greenhouse gas emissions from agricultural activities (plant and animal production) will be determined and projects to be monitored, to reduce emissions, practices will be developed for the retention and increase of the soil organic carbon substance.

National Energy Efficiency Action Plan 2017-2023 suggests actions to be taken related to increasing energy efficiency in the agriculture sector listed in the section 2.2.5 of the Plan as:

- encouraging the replacement of tractors and harvester with energy efficient ones,
- adapting energy efficient irrigation methods,
- supporting energy efficiency projects in the agriculture,
- encouraging renewable energy sources for agricultural production,
- determination of potential agricultural by-product and waste for the purpose of obtaining biomass,
- supporting energy efficiency in the aquaculture products sector.

There are various agricultural subsidy instruments offered by the government in order to regulate and create an environmentally friendly investment setting in the

agriculture sector. The amount of the financial support is constantly increasing from year to year.

Within the framework of **Good Agricultural Practices (GAP)** legislation and the **GAP Project** following the adoption of the legislation, producers can receive good agricultural practices certificates to institutions that are authorized by the MoAF to register their control and certification process. Good Agricultural Practices are important both for a high-quality and productive agricultural production and food safety. GAP allows traceability, sustainability and food safety in agriculture without harming the human health, animal health and environment. The MoAf apply a project named "The Extension and Control of Good Agricultural Practices" which will provide and support the implementation of good agricultural practices in 58 provinces by totally 81 sub-projects in 2024. The project will also include training, extension and demonstration activities. In Türkiye, good agricultural practices are generally focused on crop production, however, there are also GAP applications for aquaculture and animal husbandry in recent years. Good Agricultural Practices are also conducted in "Special Environmental Protection Areas" according to a protocol signed between the MoEUCC and the MoAF[190].

With the **IPARD Program**, support is given to soil cover management and erosion control, biodiversity/bustard population increase, and promotion and implementation of organic farming methods within the scope of agri-environment measures. In this direction, the implementation of the soil cover management and erosion control sub-measure in Beypazarı and the biodiversity-bustard population development sub-measure continue to be implemented in 8 villages of the Polatlı district where bustards are observed.

With the help of **Farmer Registry System**, a database has been created in 2014 which facilitates provision of agricultural supports in a controllable and traceable way, therefore it enables establishing healthy agricultural policies. The System holds information of farmers engaged in agricultural activities, and assets (land, animal, input, etc.) they use during the activities, product design and average yields. Also, with the help of the System agricultural supports are applied, tracked and controlled.

Also, there are other Agricultural Information Systems such as Farmer Informing Service, Türkvet, Organic Agricultural Information System (OTBIS), Underover

[190] The protocol was signed between former Ministry of Environment and Urbanization and former Ministry of Food, Agriculture and Livestock.

Registry System, Beekeeping Registry System. Agricultural Information Systems provide all inventories necessary for tracking and controlling agricultural activities and support traceability and accountability.

Organic agriculture is also being supported within the framework of Organic Agricultural Law and incentives that are implemented by the MoAF (former Ministry of Food, Agriculture and Livestock and Ministry of Forestry and Water Affairs). The Organic Agricultural Information System (OTBIS) was implemented in 2005, in order to keep updated information about several statistics such as organic agricultural products, producers and land use. The system is integrated with the Farmer Registry System. Organic agriculture legislation and programmes also provide financial incentives for organic farmers, such as grants and low interest rate loans.

Organic agriculture is a sustainable farming system with the highest level of traceability and reliability. All national and international standards in organic agriculture require that every stage of production from farm to fork be controlled and certification is mandatory. Reducing the negative effects of the destruction caused by climate change and environmental pollution on biodiversity and the sustainability of ecosystems will be achieved through organic agriculture activities. Türkiye has an important potential in terms of organic agriculture with its ecological conditions and uncontaminated natural resources. In order to evaluate this potential, it is necessary to produce in accordance with international standards and to develop the domestic / foreign market. Compared to 2002, the organic product range reached 259 ~~263~~ with an increase of 73%, and the organic production amount reached 1.6 million tons with an increase of 427% in 2023.

Within the scope of the **Organic Agriculture Expansion and Control Project** which is implemented by General Directorate of Plant Production under the Ministry of Agriculture and Forestry , it is aimed to increase the income level of farmers by producing organic products with high competitiveness in domestic and foreign markets, to ensure a healthy and balanced nutrition of the country's population, to increase the diversity of organic products, to produce organic products in accordance with international standards, to activate the control and certification system, to increase the efficiency of organic products. Important studies are carried out to establish traceability. In this context, a total of 81 projects were decided to be carried out in 59 provinces in 2024 funded under the Organic Agriculture Expansion and Control Project . In addition, audit, training and R&D studies are also continuing.

Table 26 contains Türkiye's agriculture sector policies and measures for reducing the Country's greenhouse gas emissions. Following the table, each policy/measure is described in the following subsections.

Table 26 – Agriculture sector policies and measures

PaM	Sector(s) affected	GHG(s) affected	Objective and/or activity affected	Type of instrument	Status	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact *(not cumulative, in kt CO2 eq.)* ***2030***
1 - Control of Nitrate Use	Agriculture	N2O	Protection of Waters Against Pollution Caused by Nitrates from Agricultural Sources	Regulatory	Implemented	2016	MoAF	NE
2 - Extending Analysis-Based Fertilizer Use	Agriculture	N2O	Reducing N2O emissions through promotion of efficient fertilizer use	Economic	Implemented	2017	MoAF	NE
3 - Agriculture-based Specialized Organized Industrial Zones (TDIOSB)	Agriculture	CO2	Reduction of fossil fuel-based energy consumption at agricultural production	Infrastructure	Implemented	2017	MoAF	NE
4 - Land Consolidation	Agriculture	CO2	Increasing energy efficiency at agricultural production	Regulatory	Implemented	2017	MoAF	NE
5 – Environmentally Based Agricultural Land Protection Programme (ÇATAK)	Agriculture	CO2, CH4, N2O	improving soil structure and reducing carbon emissions by taking "Minimum Soil Tillage Agriculture'' practices, saving energy and water through efficient irrigation practices	Regulatory, economic, other	Implemented	2006	MoAF	NE

6 - Sustainable Use of Agricultural Waste	Agriculture	N2O, CH4	Sustainable management of agricultural waste including material recycling and energy recovery	Regulatory	Implemented	2011	MoAF, MENR, MoEUCC	NE
7 - Reducing GHG Emissions from Livestock	Agriculture	N2O, CH4	Decreasing GHG emissions from livestock	Regulatory	Adopted	2022	MoAF	NE
8 - Program of Supporting Rural Development Investments	Agriculture	CO2, CH4, N2O	Reducing GHG emissions promotion of efficient use of irrigation water, energy and fertilizer; helping to protect quality and quantity of the soil; contributing in improvement of quality and productivity and reducing labor need	Economic, regulatory, informative , other	Implemented	2017	MoAF	NE

4.2.6.1 Control of Nitrate Use

Türkiye adopted the **By-Law on Protection of Waters Against Pollution Caused by Nitrates from Agricultural Sources**[191] which aims to limit the amount of Nitrate in water. Türkiye started to monitor the amount of nitrate by the **Nitrate Information System (NIBIS)** while the **Nitrate Vulnerable Zones** are established, and the **Nitrate Action Plans (NAPs)** are prepared. It's expected that the by-law will significantly decrease the amount of nitrate used in agriculture and thus contributed to decrease GHG emissions of Türkiye in the agriculture sector.

4.2.6.2 Analysis Based Fertilizer Use

The **By-Law on Chemical Fertilizer Control,**[192] includes technical arrangements in production, import and consumption of chemical fertilizer and are prepared for providing market control in specific standards, in compliance with rules and taking under record. By-Laws enable preventive control of exceeding specific amounts of Greenhouse Gases to be released in case chemical fertilizers are applied by analysis.

The **Programme of Extending Analysis Based Fertilizer Use** provides financial support for farmers in order to have fertilizer and soil analysis services at accredited laboratories, and to have advisory services for adequate use of fertilizers. The Programme is expected to contribute to reduction of N_2O emissions that is caused by agricultural practices.

Within the framework of the **Fertilizer Usage Control Programme**, Agricultural Credit Cooperatives gave information and guidance to technical personnel on determining the fertilizer types, manner, amount, and time of application. Agricultural engineers were given in-service training and were specialized in fertilizer and fertilization and calibration of tools and machinery to be used in fertilization. In this way, producers were prevented from using fertilizers unconsciously. These practices aimed to support reducing N2O emissions from the agriculture sector. Moreover, R&D studies were carried out for the use of controlled chemical fertilizers, and as a result of these studies, organic fertilizers were included in the fertilization program. These actions reduced the use of chemical fertilizers, decreased chemical release to the environment, and contributed to sustainable soil fertility.

[191] Official Gazette dated July 23, 2016 numbered 29779

[192] No 2015/42, which came into force in 2015

4.2.6.3 Agriculture-based Specialized Organized Industrial Zones (TDIOSB)

Türkiye promotes the establishment of Agriculture-based Specialized Organized Industrial Zones (TDIOSB) focused on plant production (greenhouse cultivation) throughout the country. The Ministry of Agriculture and Forestry incentives renewable energy, such as geothermal and solar/wind power, for heating requirements. With the TDIOSB projects supported especially in geothermal fields, environmentally friendly and sustainable food production is ensured by the cheap energy source and the reduction of costs in production, and the reduction of the use of fossil fuels, which are used extensively in greenhouses and cause environmental pollution. TDIOSBs especially carried out in the geothermal fields, provide significant support to environmentally friendly and sustainable food production. In this context, the sub-component of the **Turkey Climate Intelligent and Competitive Agricultural Growth Project (TUCSAP)** carried out by the Ministry of Agriculture and Forestry with the World Bank is to strengthen climate resistance, efficiency, and efficiency in resource use in the production of horticultural crops of TDIOSBs. It is aimed to establish Greenhouse TDIOSB in an area of 3,036,787 square meters, heated by geothermal resources.

Within the framework of By-Law on Geothermal Resources and Natural Mineral Waters and Governing Regulations of the Law on Geothermal Resources and Natural Mineral Waters greenhouses in 10 provinces performing geothermal green housing practices are under investigation in terms of economic, social and environmental outcomes.

4.2.6.4 Land Consolidation

Within the framework of legislation regarding "Soil Conservation and Land Use and Changes" it is targeted to ensure enough income for each agricultural land sizes and prevent divisions of lands into small fractions which are unfeasible to operate. Through avoiding splitting of agriculture parcels a reduction in GHG emissions is expected due to effective use of the agricultural lands, water, energy, fertilizers and machinery. Monitoring of GHG emission reduction of this measure is planned to be conducted through monitoring of reduced machinery use. Avoiding parcel division is also expected to cause changes in irrigation methods, reducing water loss and increasing irrigation efficiency.

Also, studies show that in areas in which land consolidation is made, as a result of changes in road lengths and routes, farmers' daily road distances are shortened by an average of 26.68 km (minimum 6.44 km and maximum 70.24 km) in Türkiye (Polat and Manavbaşı, 2012). Reaching to higher yield in the unit area by

optimizing the efficiency of nitrogen fertilizer use and using conservative tillage techniques can reduce N_2O and CO_2 emissions.

In this context, land consolidation works are carried out on an area of 8.5 million ha by the General Directorate of DSI. As of the end of January 2022, the registered area in Türkiye has been realized as 6.02 million ha. In 2021, consolidation registration works were completed on 1,258,117 ha of land. The 2023 target of the Ministry of Agriculture and Forestry in land consolidation and on-farm services is to complete the consolidation works on an area of 8.5 million ha.

4.2.6.5 Environmentally Based Agricultural Land Protection Programme (ÇATAK)

One of the best examples is the Environmentally Based Agricultural Land Protection Programme (ÇATAK) to agri-environmental programs. The Programme aims taking necessary precautions for increasing soil and water quality, sustainability of renewable natural resources, avoiding erosion and decreasing negative effects of agriculture, improving soil structure by taking "Minimum Soil Tillage Agriculture'' practices, saving energy and water through efficient irrigation practices, in areas where intensive agricultural activities are performed. The Programme also targets raising awareness of producers on agri-environment and increasing agricultural income of the producers by reducing input costs.

ÇATAK is the first Programme to be specifically targeted at addressing the negative impacts of agricultural practices on the environment. The programme is expected to mitigate CH4 and CO2 emissions through extension of methodologies mentioned above.

The ÇATAK program has some similarities with EU agri-environmental measures in rural development programs. As of 2019, environmentally friendly agricultural practices are performed in 58 cities, and 734,081,405 TRL in total support payment is paid to 188,661 producers covering 721,443 ha area.

4.2.6.6 Sustainable Use of Agricultural Waste

Türkiye aims for sustainable use of biomass to assist the development of country's economy towards green growth. Türkiye started to utilize livestock animals' manure as a biomass source at new biomass plants which positively impacts the Country's agriculture emissions.

4.2.6.7 Reducing GHG Emissions from Livestock

Activities conducted within the framework of Pasture Law, Animal Breeding Law, Law on veterinary services, plant health, food and feed, Specialized Organized

Industry Zones based on agriculture have direct impact in reduction of methane gas in the stock farming sector.

4.2.6.8 Program of Supporting Rural Development Investments

Support activities are being carried out in 81 cities within the scope of **Program of Supporting Rural Development Investments** to avoid excessive use of production inputs as irrigation water, energy and fertilizer by extending use of modern irrigation machinery and equipment developed for agricultural activities by producers, helping to protect quality and quantity of the soil and water resources, contributing in improvement of quality and productivity in production and reducing labor need. According to the amount of goods purchasing basis to the grant announced every year for real and legal entity applicants provided to be separately, it is made in the rate of the determined donation support (50% -75%). In 2017 65 million TRY is provided as grant for an arable land of 22,000 ha area; and cumulatively 131,000 Million TRY is provided for an arable land of 131,000 ha area since the beginning of the programme.

As of the end of 2013, productivity in agricultural production has increased and negative effects which extreme irrigations on our soil and water resources shall cause are prevented in approximately 750,000 ha area by providing the utilization of modern irrigation methods.

Also, within the scope of the **Program of Supporting Development Investments**, solar energy is being used as an energy source for agricultural irrigation systems. Initial investment costs of agricultural irrigation systems with solar energy are higher than the diesel systems. Operation and maintenance costs of agricultural irrigation systems are very low and fuel cost is zero.

4.2.7 LAND USE, LAND USE CHANGE AND FORESTRY (LULUCF)

Overview

The roots of Türkiye's forestry sector administration go back to 1839 with the establishment of Directorate of Forestry in. Protection of forest lands entered into the legal framework in 1937 and into the constitution in 1961 which have continued to exist in the constitution of 1982.

Türkiye does not have a determined carbon sink commitment within the framework of UNFCCC processes. However, protection of forests and extension of forest areas have always been a part of Türkiye's strategies and action plans in several ways. Türkiye's forest stock has shown an increasing trend over the last decades. In the direction of global and national demands, the handling of the

economic, ecological, social and cultural functions of forests within an ecosystem integrity and management of forests according to sustainable forest management principles is the basic approach of today's forestry approach.

Türkiye's **Nationally Determined Contribution** suggests the following measures for increasing national carbon sink potential through forestry sector as follows:

- Increasing sink areas and preventing land degradation
- Implementing Action Plan on Forestry Rehabilitation and National Afforestation Campaign

Currently, the national legislation on forestry does not have direct reference to increasing carbon sinks in order to fight against climate change. However, both the legislative framework and the policy documents aim at increasing forest lands, improvement of degraded forest lands and enlarging protected areas, which indirectly serve for the increase in carbon sinks of Türkiye.

Within the context of the **National Climate Change Action Plan**, overall policies and targets for forestry sector are defined as follows:

Target 1: Increase the amount of carbon sequestered in forests by 15% of the 2007 value by 2020 (14,500 Gg in 2007, 16,700 Gg in 2020)
Target 2: Reduce deforestation and forest damage by 20% of the 2007 values by 2020
Target 3: Integrate the climate change factor in land use and land use changes management strategies by 2015
Target 4: Identify the amount of sequestered carbon in pastures and meadows in 2012, and increase carbon stock 3% by 2020
Target 5: Identify the existing carbon stock in wetlands in 2012, and maintain the level until 2020
Target 6: Make necessary legal arrangements for combating climate change with regard to land use and forestry by the end of 2013
Target 7: Strengthen institutional capacity in institutions involved in land use and forestry on climate change by 2014

The **National Forestry Programme (2004-2023)** has been developed and adopted with the following objectives of protection of forest areas, forest biodiversity and natural habitats, extension and improvement of existing forest areas and providing sustainability of forest ecology while promoting economic social and cultural activities based on forests taking into account social justice. The **National**

Strategy and Action Plan to Combat Desertification (2024-2030)[193] serves as Türkiye's fundamental document outlining the strategies, objectives, and actions the country will implement in its efforts against desertification National Strategy to Combat Desertification is built around six main axes: These are:

- Strategic Axis 1: Policy and Strategy Development
- Strategic Axis 2: LDN and Sustainable Use of Natural Resources
- Strategic Axis 3: National and International Coordination and Cooperation
- Strategic Axis 4: Socio-Economic Activities
- Strategic Axis 5: R&D Activities
- Strategic Axis 6: Monitoring and Evaluation

The most updated document for forestry sector planning is the **Strategic Plan of General Directorate of Forestry (2019-2023)**. Within the framework of the plan the following strategic performance indicators are targeted extension of the fight against forest fires and increasing capacities:

- Monitoring the health of forest ecosystems and search for ways to fight with diseases
- Quality of Wood, seed and fruit efficiency will be improved. Silvicultural maintenance measures for the establishment of healthy forests will be increased.
- Ratio of growing stock per hectare will be increased from 72.9 m3 to 74.5 m3 by 2023.
- Increasing the productive forest area from 12,850,000 ha to 13,250,000 by 2021.
- The total forest land of Türkiye will increase from 28.8% to 30% by 2023.
- Combating erosion to reduce the soil loss and enhance the pasture improvement. The size of soil loss controlled area will be increased from 1,415,000 ha to 1,677,000 ha by 2021.
- Rehabilitated pasture area will be increased from 222,000 ha to 265,000 ha by 2021.
- The forest management plan and inventory of 5,605,000 ha forest land will be made in accordance with multi-purpose use.

All policy documents target effective protection of forests against various factors including fires and harmful diseases, soil conservation, afforestation, rehabilitation studies, extending monitoring practices, extension of sustainable forest

[193] MoAF, 2019.

management practices, raising awareness among public and development of the institutional capacities of relevant institutions.

On top of above-mentioned policy documents, several action plans have been adopted for various tree types separately. All action plans target at increasing the productivity of forests and extension of forest lands besides species specific targets.

All these efforts have led to several changes in forest areas and their productivity in Türkiye over the recent decades. Carbon sink potential of Türkiye has shown an increasing trend between 1990 to 2020 with an increase of 114%, reaching 57.6 Mt CO2-eq.

Also, there have been efforts to develop a forest carbon standard and certification in Türkiye, in order to integrate to the voluntary carbon market.

At the Climate Council (2022), one of the key issues discussed is management of the forestry sectors. Various policy targets were suggested for LULUCF sector. Among them recommendations on forest are covering issues:

i. ensuring to reduce pressures on sink areas and increasing protected areas based on sustainable land management,
ii. preventing land degradation, and protect and increase natural carbon sinks,
iii. strengthening the existing policies on land degradation neutrality and all ecosystems such as forests, agricultural areas, grazing lands, wetlands,
iv. strengthening ecosystem-based forestation,
v. enhancing national fire-fighting capacity including the number of equipment and staff.

And within the scope of combating climate change, forest management and forestry policies will be developed in the light of Climate Council decisions.

Table 27 contains Türkiye's LULUCF sector policies and measures for reducing the Country's greenhouse gas emissions. Following the table, each policy/measure is described in the following subsections.

Table 27 – LULUCF sector policies and measures

PaM	Sector(s) affected	GHG(s) affected	Objective and/or activity affected	Type of instrument	Status	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact *(not cumulative, in kt CO2 eq.)* ***2030***
1 - Expanding Forest Areas	Forestry / LULUCF	CO2	Extension and improvement of existing forest areas and carbon sink	Regulatory	Implemented	2004	MoAF	NE
2 - Effective Protection of Forests	Forestry / LULUCF	CO2	Protection of the forests from forest fires and other threats	Regulatory	Implemented	2004	MoAF	NE

4.2.7.1 Expanding Forest Areas

The 11th Development Plan targets to increase total forest land of Türkiye from 28.8% to 30% by 2023.

4.2.7.2 Effective Protection of Forests

11th Development Plan includes completion of the national forest inventory will be completed (Target 415.1); strengthening the capacity to fight against fires, pests and diseases will be improved; afforestation and rehabilitation activities will be accelerated (Target 415.2); promotion of industrial plantations (Target 415.4).

4.2.8 WASTE

Overview

GHG emissions from the waste sector constituted 2.9% of Türkiye's total GHG emissions, excluding LULUCF in 2022.[194] Türkiye's GHG emissions from the waste sector mainly resulted from municipal waste disposal (landfilling or wild/open dump sites) and municipal or industrial wastewater treatment and discharge systems. Although in Türkiye, the waste sector emissions have a small share compared to other sectors, there are significant efforts to reduce the emissions since waste management is also an issue of environmental protection and public health. The following cross-sectoral Strategies and plans include targets for reducing waste generation.

The **12th Development Plan** targets to increase recovery rate of waste and proportion of municipal population given landfill services. Türkiye aims reducing amounts of both solid waste and wastewater, diverting waste away from landfills, increasing biological recovery of waste which replaces landfilling, capturing or flaring methane from landfills and wastewater, rehabilitation of old dumpsites, better source separation and collection of municipal waste and increasing the use of nitrogen removal technologies in wastewater treatment contribute to GHG emissions from the waste sector. In addition to this, Plan also aims strengthening the zero waste management system, supporting green transformation, transitioning to circular economy and ensuring sustainable management of soil and water resources. The 12th National Development Plan also includes increasing re-use rate of treated wastewater, defining design standards and criteria for wastewater treatment plants with regard to the circular economy criteria.

[194] NIR, 2022.

The **Nationally Determined Contribution** of Türkiye includes plans and policies to be implemented for the waste sector:

- Not to be sent to municipal wastes to landfill sites without pretreatment
- Reuse, recycle and use of other processes to recover secondary raw materials to utilize them as an energy source or to remove wastes;
- Recovering energy from waste by using processes such as material recycling of wastes, bio-drying, bio- methanation, composting, advanced thermal processes or incineration;
- Recovery of methane gas from landfill gas from managed and unmanaged landfill sites;
- Utilization of industrial wastes as an alternative raw material or alternative fuel in other industrial sectors, through industrial symbiosis approach;
- Conducting relevant studies to utilize wastes generated from breeding farms and poultry farms;
- Rehabilitation of unmanaged waste sites and ensuring wastes to be disposed at managed landfill sites
- Increasing reuse areas and alternatives for treated wastewater,
- Protection of soil and water resources by ensuring that wastewater treatment plants are operated as biorefinery plants,

Climate Change Mitigation Strategy and Action Plan (2024-2030) overall strategies for waste sector are defined as follows:

Strategy 1: Preventing and reducing waste and wastewater before generation

Strategy 2: Improving waste recycling and recovery rates within the scope of the Zero Waste Policy

Strategy 3: Reducing amount of untreated waste disposed to landfills

Strategy 4: Improving wastewater management and treatment infrastructure

Strategy 5: Developing human resources and social awareness as part of zero waste practices and reduction of GHG emissions

Strategy 6: Developing incentive and financing mechanisms to improve waste management, taking into account circular economy principles and GHG emission reduction

Strategy 7: Increasing R&D activities and developing technological infrastructure to improve waste management, taking into account circular economy principles and GHG emission reduction

Strategy 8: Increasing use of waste as raw material / resource in production processes

The **National Waste Management Action Plan (2016-2023)** was prepared within the framework of the approximation process to the EU Environmental Acquis. In the action plan, the objective of the waste sector is defined as "ensuring effective waste management". Under the plan; by analyzing the present situation of waste management, it is aimed to separate collection, recycling, recovery by different methods and disposal methods of waste according to the types of wastes. At the same time, it was aimed to determine "sustainable waste management strategies" throughout the country by ensuring recycling and recovery and recycling of waste materials into the economy in order to prevent rapid consumption of natural resources. The National Waste Management Action Plan sets goals for local authorities in all 81 provinces towards an integrated waste management system, which will require more recovering, recycling and energy production from waste and accordingly limit the number of sanitary landfills needed as it is aimed at in circular economies. The National Waste Management and Action Plan presents general plans in the waste management sector for municipal waste as well as packaging waste, medical waste and hazardous waste. This plan, which functions as a roadmap for investments, also includes information regarding the place, time frame and the required capacity for plants to be built, and afterwards a national strategy is developed on the reduction of the biodegradable waste to be disposed of in landfills. Preparation works for a new National Waste Management Strategy and Plan is completed to cover the years 2024-2035 by revising the current National Waste Management and Action Plan (2016-2023). By this plan, it is aimed to develop the current plan compatible with zero waste management system project, to increase and mainstream the efficiency of collecting separately at the source, to enhance the recovery rates of the wastes, to determine the recovery and disposal methods on the regional basis and to reveal the capacities of relevant facilities and to establish a sustainable waste management planning for 2023-2035. Regional Waste Management Plans will also be prepared taking into account the waste management system at national level. By the year 2023, it is targeted to recover 35% and to dispose to landfills 65% of the waste generated.

Türkiye added a supplementary clause to the Environmental Law (law no. 2872) on circular economy. The Country also started the preparation of **the National**

Circular Economy Strategy and Action Plan.[195] It's expected that the circular economy approach will help Türkiye to decrease its GHG emissions.

Table 28 contains Türkiye's waste sector policies and measures for reducing the Country's greenhouse gas emissions. Following the table, each policy/measure is described in the following subsections.

[195] "Technical Assistance for Assessment of Turkey's Potential on Transition to Circular Economy Project" was initiated. With the project outputs, the transition to a circular economy, which also contributes to more efficient resource and waste management throughout Türkiye, will be encouraged. It is aimed to strengthen Türkiye's institutional and technical capacity in various aspects such as knowledge, strategic documents including relevant legislation, and human resources.

Table 28 – Waste sector policies and measures

PaM	Sector(s) affected	GHG(s) affected	Objective and/or activity affected	Type of instrument	Status	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact *(not cumulative, in kt CO2 eq.)* ***2030***
1- Zero Waste Policy	Waste Management / Waste	CO2, CH4 N2O, F-Gases	Prevention of waste and re-use/recycling/recovery of waste	Regulatory, other	Implemented	2018	MoEUCC	NE
2 - Decreasing the sending amount of municipal waste to landfills	Waste Management / Waste	CH4, N2O	Reducing methane emissions from landfills and increasing the material recovery rates according to the circular economy principles	Regulatory, economic, other	Implemented	2011	MoEUCC, MENR and Municipalities	NE
3 - Actions implemented under Wastewater Treatment Action Plan	Waste Management / Waste	CH4, N2O	Reducing GHG emissions through reuse of wastewater and promotion of clean technologies for wastewater treatment plants	Regulatory, other	Implemented	2015	MoEUCC, MENR and Municipalities	NE
4 - Establishment of deposit return scheme	Waste Management / Waste	CH4, N2O	Reducing GHG emissions through recycling of waste which are made from recyclable materials such as plastics and glass	Economic, other	Adopted	2020	MoEUCC, TÜÇA	NE

5- Increasing the capacity of RDF preparation facilities	Waste Management / Waste	CH4, N2O	Decreasing the amount of waste sent to landfills through expanding RDF production from municipal waste unsuitable for recycling or recovery.	Regulatory, economic, other	Implemented	2015	MoEUCC, MENR and Municipalities NE

4.2.8.1 Zero Waste Policy

The main aim of Türkiye is to decrease the amount of waste generation. For this purpose, Türkiye started the **Zero Waste Project** and adopted the **By-law on Zero Waste**[196] in 2019. Objective of the by Law is to recognize the general rules and principles regarding the establishment, dissemination, development, monitoring, financing, recording and certification of the zero-waste management system. The By-law aims for waste prevention as the main priority and regulates the segregation of the waste at the source and separate collection of recyclable wastes. With the implementation of the By-Law, a reduction at the amount of waste has been sent to landfills will also decrease. Eleven operational guidelines have been prepared by the Ministry to guide the realization of the works related to the establishment, operation and monitoring of a sustainable zero waste management system. Provincial Zero Waste Management System Plans were prepared in 2020 by 81 provinces containing measures for establishing a zero-waste management system within the province.

In 2017 recycling rate was 13%, in 2021 it increased to 27.2 % and in 2023 to 34.92% and it is foreseen to increase 60% by 2035. Since 2017 33.8 million tons of recyclable waste brought back into the economy. An economic gain of 62.2 billion TL was achieved from the collected wastes 3.9 million ton CO2 eq. were prevented.

Recycling strategy of Türkiye mostly based on management of recyclable material. Recycling rate is expected to increase from 34.92% in 2023 to 60% in 2035 and also it is envisaged to contribute to 'zero waste vision' of the MoEUCC.

In order to prevent negative effects caused by plastic bags, a legal arrangement has been made for the payment of plastic bags for transportation purposes at the sale points such as markets and stores as of 1 January 2019. Through this policy, between 2019 and 2023 the formation of 1,012,699 tons of plastic waste was prevented. With this reduction, the import of plastic raw materials necessary for the production of plastic bags in Türkiye has been prevented and approximately 6.98 billion Turkish liras have been saved, as well as approximately 31,500 tons of greenhouse gas emissions have been prevented.

Türkiye also aims to increase its waste recovery rates through increasing waste-derived fuel usage in its manufacturing industry. (See Section 4.2.5.3)

[196] Published on Official Gazette No 30829 on July 12, 2019

4.2.8.2 Decreasing the sending amount of municipal waste to landfills

The waste management hierarchy is used as a tool to determine the priority of waste management, to view waste as a valuable resource, and to evaluate processes that protect the environment from the most appropriate to the least appropriate. The hierarchy indicates the order of preference in the actions to be taken by creating a pyramidal scheme to reduce waste and protect and manage resources. According to the ideal waste management hierarchy, preventing and reducing waste where it is generated and reusing waste where it cannot be prevented are the priority steps in the waste management hierarchy. Wastes that cannot be reused must be recycled, recovered, or recovered as energy in order to be introduced into the economy. However, if no suitable recovery method is available, final disposal of waste should be preferred.

In accordance with the studies on municipal waste management conducted since 1991, the number of landfills has increased significantly. The number of landfills has increased from 2 in 1994 to 94 at present. These facilities provide waste management services to 1,248 municipalities and 94.5% of the urban population. Türkiye aims to end landfilling of municipal waste not subject to pre-treatment by 2053. (see Section 2.10)

4.2.8.3 Power Generation from Wastewater Treatment Plants

Wastewater Treatment Action Plan (2017-2023), which has been prepared in accordance with the Environment Law and Strategic Plan of the MoEUCC. The Wastewater Treatment Action Plan aims to strengthen the wastewater treatment capacity of Türkiye. The Plan also promotes reuse of wastewater and cleaner production technologies for wastewater treatment plants which contribute to climate change mitigation. According to the Wastewater Treatment Action Plan (2017-2023), 1422 wastewater treatment facilities are planned to be installed by 2023.

Between 2002 to 2020, number of wastewater biogas facilities with methane recovery increased from 2 to 25. In these 25 sites, 30.9 kt of methane was recovered in 2020.[197] (see Section 2.10)

4.2.8.4 Establishment of Deposit Return Scheme

Türkiye is setting a nation-wide **deposit refund scheme** for collection and recycle of waste which are made from recyclable materials such as plastics and glass.

[197] NIR, 2022 p. 412.

Türkiye has established the Türkiye Environmental Agency (TÜÇA) in 2020 and one of the main responsibilities of the Agency is the establishment of the deposit system. The impact of the system will be visible in the next reporting cycles to the UNFCCC.

4.2.8.5 Increasing the capacity of RDF preparation facilities

The ideal waste management hierarchy, preventing and reducing waste where it is generated and reusing waste where it cannot be prevented are the priority steps in the waste management hierarchy. Wastes that cannot be reused must be recycled, recovered, or recovered as energy in order to be introduced into the economy. However, if no suitable recovery method is available, final disposal of waste should be preferred. At this point, the rate of municipal waste recycling has to be accelerated. On the way to the 2053 Net Zero Emission Target, the municipal waste recycling rate target for 2035 has been set at 60%. In order to achieve these goals, it is planned to increase the number and capacity of RDF facilities and the amount of waste sent to these facilities and reduce the amount of waste sent to managed landfills.

4.2.9 POLICIES AND MEASURES IN ACCORDANCE WITH ARTICLE 2

Overview

Table 29 contains Türkiye's policies and measures in accordance with Article 2 for reducing the Country's greenhouse gas emissions. Following the table, each policy/measure is described in the following subsections.

Table 29 - Policies and measures policies and measures in accordance with article 2

PaM	Sector(s) affected	GHG(s) affected	Objective and/or activity affected	Type of instrument	Status	Start year of implementation	Implementing entity or entities	Estimate of mitigation impact *(not cumulative, in kt CO2 eq.)* ***2030***
1 - Collection of maritime transport fuel consumption data	International Travel	CO2	Collection of fuel consumption data for each type of fuel used in maritime	Regulatory, economic	Implemented	2016	MoTI	NE
2 - Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)	International Travel	CO2	National actions in accordance with the international affords to limit the international aviation emissions to the 85% of 2019 international emission levels	Regulatory, economic	Implemented	2018	Directorate General of Civil Aviation	NE
3 - 2050 Net-zero Carbon Emission Initiative	International Travel	CO2	National actions in accordance with the international affords to have net carbon zero aviation in 2050	Regulatory, economic	Adopted	2022	Directorate General of Civil Aviation	NE

4.2.9.1 Collection of maritime transport fuel consumption data

Amendments to MARPOL Annex VI on Data collection system for fuel oil consumption of ships, entered into force on 1 March 2018.[198] Under the amendments, ships of 5,000 gross tonnage and above are required to collect consumption data for each type of fuel oil they use, as well as other, additional, specified data including proxies for transport work. Within this framework, Türkiye has been working on the necessary institutional, administrative and technical preparations in order to comply with the Decision. For the data gathering system to be launched on 1 January 2019, official communication has been made in September 2018 to maritime enterprises and classification societies in order to take the necessary actions.

Türkiye is involved in several international cooperation incentives regarding maritime transport. Türkiye is involved in several technical study groups established for the development of maritime lines within the scope of the Organization of the Black Sea Economic Cooperation (BSEC) Secretariat, which is undertaken by the Ministry of Transport and Infrastructure.

4.2.9.2 Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)

The Ministry of Foreign Affairs acts as the focal point and responsible body for implementation of decisions taken by ICAO. Türkiye is among the 44 members of the European Civil Aviation Conference (ECAC) which is the largest civil aviation organization in Europe in charge with working closely and cooperatively with other regional organizations and individual Contracting States of ICAO on a range of civil aviation issues of common interest, including security, safety and environmental fields.

As of July 2018, 68 countries, including Türkiye, representing over 70% of the world air traffic submitted their intention to take responsibility to reduce CO2 emissions from international aviation from the pilot and first phase (i.e. between the years 2021-2027) of the **Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)** scheme voluntarily.

Once fully implemented, CORSIA scheme could keep international CO2 emissions as 2020 levels (carbon neutral growth from 2020). ICAO Standards and Recommended Practice (SARP) documents regarding to implementation of CORSIA scheme approved at ICAO Council on 27 June 2018 and circulated to

[198] Adopted by resolution MEPC.278(70).

Member States. Since this date, national airlines have been carrying out emission monitoring, reporting and verification activities. The studies of providing accreditation on the CORSIA scheme, which TÜRKAK started in 2019, yielded results and TÜRKAK has announced accredited a verification body under ISO 14065: 2013 for ICAO CORSIA aviation emissions scheme for the first time on 25 June 2021. The scheme is now open for other potential verification bodies to apply for accreditation.

4.2.9.3 Aviation Sector 2050 Net-zero Carbon Emission Initiative

Some of the Turkish aircraft operators committed to achieve 2050 net-zero carbon emission initiative established by International Air Transport Association (IATA). Türkiye also participates to several international organizations and initiatives regarding civil aviation such as EUROCONTROL, ECAC, International Civil Aviation Organization (ICAO), North Atlantic Regional Aviation Safety Group and JAA TO.

Several domestic measures are taken in order to reduce GHG emissions of aviation sector. SMART project that aims to modernize the air traffic system targets to provide energy efficiency. Also, several airline companies are taking measures to reduce fuel consumption per passenger via renewal of their fleets with new and modern and energy efficient airplanes. Ways of shortening flight routes, reducing fuel consumption during taxi and cruise are also being investigated.

4.2.9.4 Minimization of Adverse Effects in Accordance with Art.2 of the Kyoto Protocol

Each Annex I Party shall provide information on how it strives to implement policies and measures under Article 2 of the Kyoto Protocol in such a way to minimize adverse effects, including adverse effects of climate change, effects on international trade, and social environmental and economic impacts on other Parties under Article 4, paragraphs 8 and 9, of the Convention, taking into account Article 3 of the Convention.

In Türkiye, policies developed to tackle climate change are formulated and implemented in a way that minimize the potential adverse impacts on specific sectors of economic activity, industrial sectors or other Parties to the Convention, including the adverse effects on the international trade, social, environmental and economic impacts in developing countries.

Domestic sectoral and national policies, measures and actions that are developed and implemented for GHG emission reduction considers all sectors of economic activity which are related with GHG emissions or with carbon sinks.

4.2.9.5 Minimization of Adverse Impacts in Accordance with Article 3, Paragraph 14 of the Kyoto Protocol

Türkiye, as a Party included in Annex I with No commitments inscribed in Annex B to the Kyoto Protocol, has No obligation to report on the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol.

4.2.10 POLICIES AND MEASURES NO LONGER IN PLACE

4.2.10.1 Promotion of Phasing out of Old Vehicles

Based on the provisional revisions made in year 2016 in the Law on Special Consumption Tax (SCT), No.4760, tax exemption will be applied at the phase of first acquisition in case of upgrading old commercial vehicles such as taxis, minibuses, service buses, public buses and trucks with newer vehicles which are more energy efficient, until 30 June 2019.

As of 31.12.2019, the implementation of both SCT exemption granted for the update of commercial vehicles regulated by the provisional Article 7 added to the Special Consumption Tax Law with the Article 54 of the Law No. 6745 and incentives regarding the scrapping of the vehicles over a certain age regulated in the provisional Article 1 of the Law No.7103 were ended. There is currently no regulation for scrap incentives.

5 PROGRESS TRACKING FOR ACHIEVING NDC AND PROJECTIONS

Türkiye developed its GHG emissions projections during the preparation and revision of its NDC. First, on 30 September 2015, Türkiye submitted its Intended Nationally Determined Contribution (INDC) to UNFCCC. Baseline and mitigation scenarios were established, and these scenarios were shared at the 6th and 7th NCs of the County. Türkiye submitted the same target as the NDC to the UNFCCC without changing its target and assumptions in 2022. Second, Türkiye announced raising the targets of this first NDC during COP27. While Türkiye worked on alternative mitigation scenarios for the updated first NDC, as mentioned at the eight NC; these studies will be elaborated in the second BTR and ninth NC reporting cycle.

The GHG emission projections of the INDC (and first NDC) by 2030 are based on two scenarios: Business-As-Usual Scenario (BAU) and Mitigation Scenario The baseline scenario of the first NDC represents the without-measures scenario of the Country. The projections have been prepared based on the works done under the project called *"Preparation of Türkiye's Sixth National Communication on Climate Change"*, which was carried out by the former MoEU and the TÜBİTAK, Marmara Research Center. ***TIMES-MACRO*** model has been used for energy related modeling and industrial processes and product use, while for non-energy emissions different national models and studies have been used.

Türkiye did not calculate majority of its NDC PaM's emission reduction impacts. Thus, as individual policies' effects are not estimated, these policies' cumulative impacts are not estimated as well. (Figure 67)

5.1 KEY ASSUMPTIONS

The baseline and assumptions used to estimate the projections of greenhouse gas emissions are presented in Table 30. Türkiye achieved 230% increase in GDP between 1990 and 2012. Its population has increased to 75.6 million by more than 30% from 1990 to 2012. Türkiye's energy demand increases by 6-7% each year. At the preparation of the INDC, according to the projections by MENR, electricity demand in 2030 was expected to reach 580 TWh under the business-as-usual scenario. These assumptions have lost their validity, initially used in the INDC preparation in 2015. Türkiye is updating these assumptions within the scope of the ongoing preparation of the updated NDC. However, assumptions of the updated NDC will be available for sharing at the second BTR and 9th NC of Türkiye.

Emission factors used to estimate greenhouse gas emissions are based on 2014 National Inventory Report published by TurkStat, 2006 IPCC Guidelines and collected data provided by various national institutions. Global warming potential on a 100-year timescale used for the calculation of CO2 equivalent emissions is in accordance with the IPCC's Fourth Assessment Report.

Table 30 – Key Assumptions used in the projections of the first NDC[199]

Key underlying assumptions and parameters	Unit, as applicable	Latest GHG Inventory Year Data	Projections of underlying assumption/parameters	
		2022	2025	2030
Population	million	85.28	85.57	88.43
Population growth	%	0.91%	0.75%	0.60%

5.2 BUSINESS-AS-USUAL SCENARIO (WITHOUT MEASURES)

This scenario projects GHG emissions up to 2030 based on the case of the mitigation measures which have been implemented, adopted or planned since 2012 will not be implemented between 2012 and 2030. GHG emissions for 1990-2020 and projected emissions for 2030 are listed in Table 31 based on the type of greenhouse gases and sectors. CO2 emissions are projected to increase about 187% by 2030 compared to 2012. CO2 emissions, which were 79% of the total emissions in 2012, are projected to be 87% to total emissions in 2030 (excluding LULUCF) due to a gradual increase in energy consumption.

The ratio of CH4 and N2O emissions to total emissions is 15% and 5% in 2012. The ratio of CH4 emissions to total emissions is forecasted to be 9% in 2030, while the ratio of N2O emissions to total emissions is estimated as 3% in 2030. On the other hand, the ratio of fluorinated gases emissions to total emissions is not expected to change much by 2030.

Table 31 - Emissions by sector based on Business-As-Usual Scenario (Without Measures)[200]

GHG emission projections-scenarios (Mt CO2 eq.)	
GHG emissions and removals	WoM

[199] These parameters and assumptions were used in the preparation of the INDC and have been maintained for the NDC. The updated parameters and assumptions, which were applied in the estimations for the Updated First NDC, will be provided with the second BTR and the ninth NC.

[200] The GHG emission projection figures for year 2030 are based on Türkiye's INDC, which has bee n submitted on 30 September 2015. The projections have not been updated since then. The bas e year for the projections is 2012. However, the GHG emission trends for 1990-2020 have been updated based on Türkiye's latest GHG Inventory.

Year	1990	2000	2010	2020	2022	2025	2030
By Sector							
Energy (including transport)	143.15	219.76	290.94	369.52	400.59		943.55
Transport	26.91	36.41	45.35	80.59	91.87		136.51
IPPU	22.69	26.05	48.57	67.24	69.91		169.75
Agriculture	51.85	46.03	47.68	76.44	71.51		59.28
Forestry / LULUCF	-66.29	-68.05	-72.15	-57.76	-56.27		-38.70
Waste management	10.32	14.54	18.08	16.98	16.26		40.90
By Gas							
CO2 emissions (with LULUCF)	87.71	164.02	245.35	356.40	385.01		1,018.36
CO2 emissions (without LULUCF)	154.14	232.35	317.56	414.38	441.42		1,057.06
CH4 emissions (with LULUCF)	51.35	51.71	60.09	73.61	72.23		107.65
CH4 emissions (without LULUCF)	51.26	51.53	60.06	73.49	72.16		107.65
N2O emissions (with LULUCF)	22.23	22.12	24.48	36.21	34.36		33.05
N2O emissions (without LULUCF)	22.18	22.02	24.45	36.11	34.29		33.05
HFCs	NO	0.11	2.79	6.01	10.18		13.44
PFCs	0.42	0.37	0.35	0.01	0.01		NE
SF6	NO	0.01	0.07	0.17	0.21		2.27
NF3	NO	NO	NO	NO	NO		NO
Total with / without LULUCF							
Total (with LULUCF)	161.71	238.34	333.12	472.42	502.00	934.00	1,174.78
Total (without LULUCF)	228.00	306.39	405.27	530.18	558.27	0.00	1,213.48

In business-as-usual scenario, emissions from energy consumption are projected to increase about 40.5 Mt CO2-eq. per year for 2020-2030. Historical GHG emissions for selected years between 1990-2022 and projected emissions up to 2030 for business-as-usual scenario are listed at Table 31 based on the type of greenhouse gas.

5.3 MITIGATION SCENARIO (WITH MEASURES)

With measures scenario (WM) includes emissions for 2012-2030, which were developed based on the mitigation policies and measures included in the first NDC, which had been prepared as INDC of Türkiye. Table 32 represents the results of the scenario; however, emissions listed for selected years between and including 1990 to 2022 in the Table are realized emissions. However, figures for 2025 and 2030 represents the estimations of the WM scenario for that year.

WM scenario is being updated as part of the first NDC revision study, and details of new estimations will be shared in the 2nd BTR and 9th NC. However, first BTR includes estimated sectoral breakdown of 2025 and 2030 targets. The 2030 targets in Türkiye's Initial and Updated NDCs are economy-wide rather than sector-

specific. The figures provided are sectoral estimates intended to illustrate anticipated contributions across different sectors.

Table 32 - Emissions by sector based on Mitigation Scenario (With Measures) [201]

GHG emission projections-scenarios (Mt CO2 eq.)

GHG emissions and removals								WM
Year	1990	2000	2010	2020	2022	2025	2030 (Pre.)	2030 (Upd.)
By Sector								
Energy (including transport)	143.15	219.76	290.94	369.52	400.59	456.35	874.26	538.48
Transport	26.91	36.41	45.35	80.59	91.87	109.23	135.99	121.53
IPPU	22.69	26.05	48.57	67.24	69.91	91.24	169.75	118.50
Agriculture	51.85	46.03	47.68	76.44	71.51	84.70	59.28	88.58
Forestry / LULUCF	-66.29	-68.05	-72.15	-57.76	-56.27	-58.35	-69.71	-68.16
Waste management	10.32	14.54	18.08	16.98	16.26	19.25	31.40	18.08
By Gas								
CO2 emissions (with LULUCF)	87.71	164.02	245.35	356.40	385.01	467.70	790.34	564.38
CO2 emissions (without LULUCF)	154.14	232.35	317.56	414.38	441.42	513.27	860.05	618.83
CH4 emissions (with LULUCF)	51.35	51.71	60.09	73.61	72.23	73.45	91.82	77.88
CH4 emissions (without LULUCF)	51.26	51.53	60.06	73.49	72.16	70.39	91.82	74.82
N2O emissions (with LULUCF)	22.23	22.12	24.48	36.21	34.36	52.04	31.10	53.22
N2O emissions (without LULUCF)	22.18	22.02	24.45	36.11	34.29	51.85	31.10	53.01
HFCs	NO	0.11	2.79	6.01	10.18		13.44	
PFCs	0.42	0.37	0.35	0.01	0.01		NE	
SF6	NO	0.01	0.07	0.17	0.21		2.27	
NF3	NO	NO	NO	NO	NO	NE	NE	NE
Total with / without LULUCF								
Total (with LULUCF)	161.71	238.34	333.12	472.42	502.00	593.19	928.99	695.48
Total (without LULUCF)	228.00	306.39	405.27	530.18	558.27	635.52	998.70	735.49

Calculations under the NDC BAU scenario were conducted in 2013. However, over the years, these calculations have largely lost their relevance. Revised

[201] The GHG emission projection figures for year 2030 are based on Türkiye's INDC, which has bee n submitted on 30 September 2015. The base year for the projections is 2012. However, the GHG emission trends for 1990-2022 have been updated based on Türkiye's latest GHG Inventory.

calculations in the Updated First NDC show that Türkiye can achieve greater reductions in all sectors except agriculture. In contrast, emissions in the agricultural sector are expected to increase compared to the initial NDC.

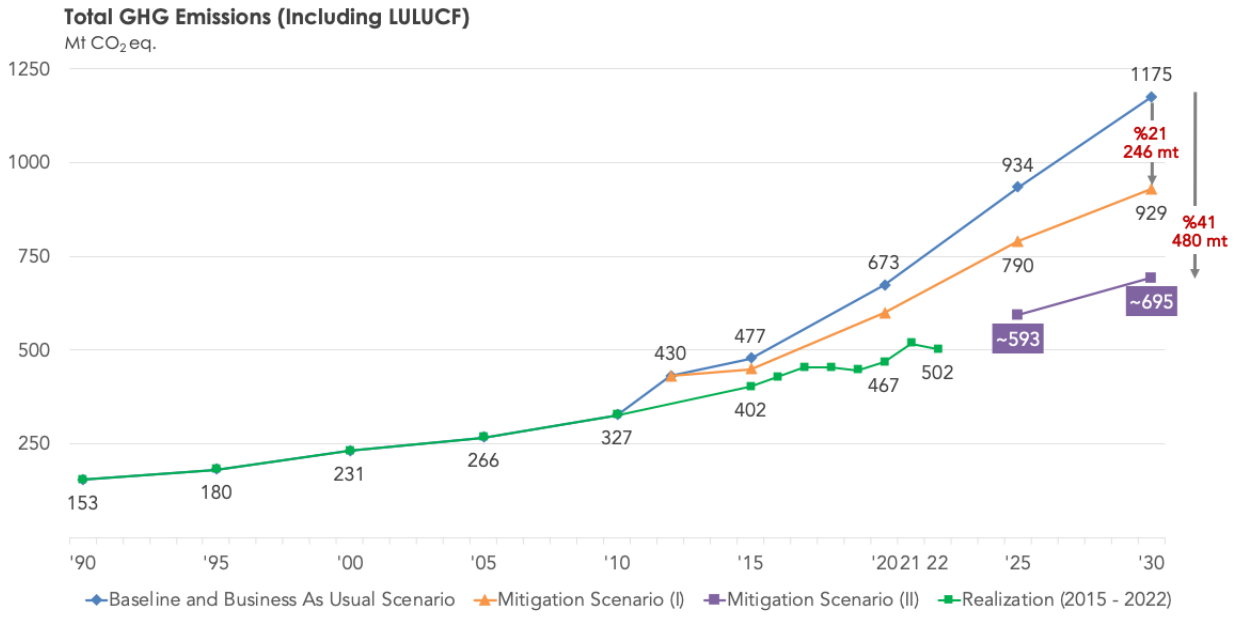
Table 33 – Sectoral Comparison of 2030 Targets of First and Updated First NDC of Türkiye*

Sector	First NDC 2030 Target	Updated First NDC 2030 Target	Difference (%)
Energy (excluding transport)	738.27	416.95	-44%
Transport	135.99	121.53	-11%
IPPU	169.75	97.81	-42%
Agriculture	59.28	82.87	40%
Forestry / LULUCF	-69.71	-40.01	-43%
Waste management	31.40	16.33	-48%

*The 2030 targets in Türkiye's Initial and Updated NDCs are economy-wide rather than sector-specific. The figures provided are sectoral estimates intended to illustrate anticipated contributions across different sectors.

The emission reductions to be achieved by policies and plans, which are explained in detail in Chapter 4, compared to the without measures are presented in the Figure 67 below.

Figure 67 – Türkiye's GHG emission projections in With and Without Measures Scenarios



The total GHG emissions realized for 2020 (both with and without LULUCF) remained below the estimated baseline (WoM) and mitigation (WM) scenario amounts. (Table 34, Figure 68) The COVID-19 pandemic and economic situation

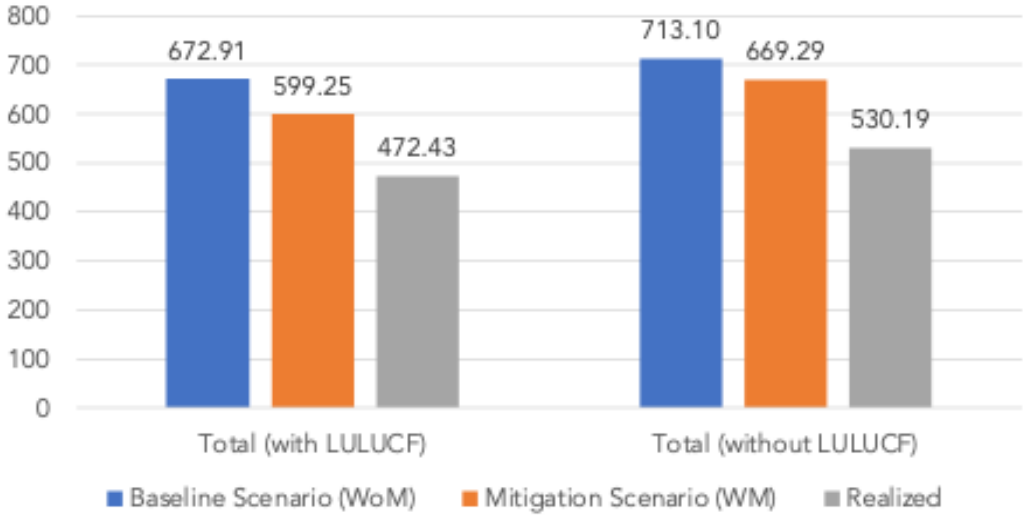
have significantly impacted GHG emissions in recent years. While Türkiye's GDP (constant 2015$) slightly increased, GDP (current price) decreased significantly by 7% in 2018 and 5% in 2019 compared to the previous year. Between 2017 and 2019, Türkiye's GHG emissions decreased by 4%. While Türkiye's total emissions increased by 3% from 2019 to 2020, the increase was limited. For instance, due to the COVID lockdowns and travel restrictions, a reduction in transport sector emissions occurred by 2% during the same period.

Table 34 – Comparison of baseline scenario (WoM), mitigation scenario (WM) and realized GHG emissions for 2020

GHG emission projections-scenarios (Mt CO2 eq.) (2020)

GHG emissions and removals				
Year	**Realized**	**Baseline Scenario (WoM)**	**Mitigation Scenario (WM)**	**Difference of Realized to WM (%)**
By Sector				
Energy (including transport)	369.52	538.89	499.34	-35%
Transport	80.59	101.19	101.11	-25%
IPPU	67.24	94.75	94.79	-41%
Agriculture	76.44	51.56	51.56	33%
Forestry / LULUCF	-57.76	-40.19	-70.04	-21%
Waste management	16.98	27.90	23.61	-39%
By Gas				
CO2 emissions (with LULUCF)	414.38	561.86	494.06	-19%
CO2 emissions (without LULUCF)	356.40	602.05	564.09	-58%
CH4 emissions (with LULUCF)	73.49	76.55	71.21	3%
CH4 emissions (without LULUCF)	73.61	76.55	71.21	3%
N2O emissions (with LULUCF)	36.11	25.72	25.17	30%
N2O emissions (without LULUCF)	36.21	25.72	25.17	30%
HFCs	6.01	7.50	7.50	-25%
PFCs	0.01	NE	NE	NE
SF6	0.17	1.27	1.27	-647%
NF3	NO	NO	NO	NO
Total (with / without LULUCF)				
Total (with LULUCF)	553.01	774.10	700.37	-27%
Total (without LULUCF)	610.77	814.29	770.41	-26%

Figure 68- Comparison of baseline scenario (WoM), mitigation scenario (WM) and realized GHG emissions for 2020



5.4 NDC INDICATORS

5.4.1 PRIMARY INDICATOR

5.4.1.1 Description and Projection of the Primary Indicator

The primary target presented in Türkiye's updated first NDC is an economy-wide reduction in emissions. In alignment with this goal, Türkiye has chosen ***Greenhouse Gases Reduced with Respect to the Business as Usual (BAU)*** to measure progress. This approach establishes the BAU scenario as a baseline, with anticipated reductions demonstrating Türkiye's commitment to mitigating GHG emissions across all sectors.

Table 35 – Projection of Main Indicator

Key indicator	Unit, as applicable	Latest GHG Inventory Year Data	Projections of key indicator	
		2022	2025	2030
Greenhouse Gases Reduced with Respect to the BAU	Mt CO2 eq.	502.00	593.19	695.48

5.4.1.2 Progress Made Towards the NDC

Indicator	Unit, as applicable	Indicative Years			Implementation Years		Target level	Target year	Progress made towards the NDC
		2012	2020	2021	2022	… 2030			
Net Greenhouse Gases Reduced with Respect to the BAU	Mt CO2 eq.	413.37	472.42	524.04	502.00		695.00	2030	The calculation for 2022 is still ongoing. However, progress toward the BAU scenario for 2020, though outside the scope of the NDC implementation period, has been assessed. According to these calculations, Türkiye achieved significant success in 2020 by reducing its emissions to 553.01 Mt CO_2 eq., which is 40% lower than the BAU scenario and even 27% lower than the mitigation scenario.
Total GHG emissions and removals consistent with the coverage of the NDC	Mt CO2 eq.	413.37	472.42	524.04	502.00		695.00	2030	Same as the main indicator
Contribution from the LULUCF sector	Mt CO2 eq.	-50.85	-57.76	-47.95	-56.27		N/A		N/A

5.4.2 ADDITIONAL INDICATORS

5.4.2.1 Progress Towards Additional Indicators

In addition to the main indicator, Türkiye has identified a total of nine additional indicators to assess the outcomes of its climate change policies, covering both mitigation and adaptation aspects. The table provides information on the progress of these indicators, with positive advancement observed across all areas.

Additional Indicators	Baseline Year	NDC Implementation Years		Progress (Last Year to Baseline) (%)
	2020	2022	2023	
Avoided CO_2 Emissions with Newly Installed Renewable Power Plants	19.6		21.8	11%
Share of Renewable Resources in Electricity Generation	41.7		42.1	1%
Urban Rail Systems Network Length	864		1013.2	17%
Ratio of Forest Areas to Country Area	29.8		29.8	0%
Number of Metropolitan Municipality Completed Local Climate Change Action Plans	12		25	108%
Number of Drinking and Potable Water Treatment Plants	714		714	0%
Ratio of Municipality Population Served by Wastewater Treatment Plant to Total Municipality Population	89		90.7	2%
Proportion of Municipal Population with Landfill Services	88		94.5	7%
HFCs Consumption	46.1			

5.5 SUPPLEMENTARITY RELATING TO THE MECHANISMS PURSUANT TO ARTICLES 6, 12 AND 17 OF THE KYOTO PROTOCOL

Türkiye, as a Party included in Annex I with no commitments inscribed in Annex B to the Kyoto Protocol, has no obligation to report on supplementary relating to the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol.

6 CLIMATE CHANGE IMPACTS AND ADAPTATION

6.1 NATIONAL CIRCUMSTANCES, INSTITUTIONAL ARRANGEMENTS, AND LEGAL FRAMEWORKS

Türkiye has established a robust institutional framework to address climate change impacts and adaptation, supported by a comprehensive range of policies, strategies, plans, and legislative instruments. The institutional landscape comprises various government ministries, agencies, and local authorities, each playing a distinct role in planning, coordinating, and implementing climate adaptation actions across different sectors. The key institutions involved in these efforts include the Directorate of Climate Change, under the Ministry of Environment, Urbanization, and Climate Change, Ministry of Agriculture and Forestry, the Directorate General of Water Management (DGWM), the General Directorate of State Hydraulic Works (DSI), the General Directorate of Agricultural Reform, the Agriculture and Rural Development Support Institution, the General Directorate of Fisheries and Aquaculture, the General Directorate of Combating Desertification and Erosion, the Turkish Water Institute (SUEN), the Disaster and Emergency Management Presidency (AFAD), the Turkish State Meteorological Service (TSMS), the Ministry of Culture and Tourism, the Ministry of Health, the Ministry of Energy and Natural Resources, the Ministry of Industry and Technology and the Ministry of Transport and Infrastructure and TUBITAK-MAM. These institutions play crucial roles in formulating and implementing climate adaptation strategies across various sectors.

6.1.1 National Circumstances

Türkiye has made strides in enhancing its adaptive capacity through institutional frameworks, policy integration, and sector-specific strategies. The **Climate Change Adaptation Strategy and Action Plan (2024-2030)** aims to adapt to climate change impacts and manage climate risks across priority sectors such as water resources, agriculture, biodiversity and ecosystem services, public health, urban areas, tourism and cultural heritage, energy, industry and transportation and communication. Additionally, Türkiye has developed **Local Climate Change Adaptation Strategy and Action Plans** for four municipalities as a pilot study, enhancing localized adaptation efforts. However, challenges remain in terms of capacity building at local levels, financing adaptation projects, and ensuring coherent governance across multiple sectors.

6.1.2 Institutional Arrangements

Türkiye has established a comprehensive institutional framework for addressing climate change impacts and implementing adaptation strategies. Central to this framework is the **Climate Change and Adaptation Coordination Board**, which plays a pivotal role in overseeing all climate-related activities. The Board brings together representatives from various ministries, ensuring a coordinated approach to adaptation measures. This multi-sectoral collaboration is essential for integrating climate adaptation into broader national and sectoral policies.

The Directorate of Climate Change supports the Board by facilitating its operations, ensuring effective implementation of the Board's decisions, and managing data governance. This Directorate plays a crucial role in operationalizing legal frameworks and adaptation policies, ensuring that all actions align with Türkiye's national priorities under the Paris Agreement.

Additionally, **local administrations and municipalities** play an active role in climate change adaptation, particularly in implementing **Local Climate Change Action Plans (LCCAPs)**. These local plans, developed with support from national ministries, are tailored to address city-specific climate vulnerability and risks assessments across climate hazards such as heatwaves, droughts and heavy precipitation. This decentralized approach ensures that adaptation measures are locally relevant and practically applicable.

Moreover, the involvement of various stakeholders, including **NGOs, the private sector, and public institutions**, is integral to the success of Türkiye's climate adaptation strategy. Stakeholders participate in workshops, consultations, and project steering committees, contributing to decision-making and ensuring that climate adaptation efforts are inclusive and address the needs of vulnerable populations. This collaborative approach not only strengthens institutional capacity but also fosters ownership and commitment to adaptation initiatives across different sectors and regions.

The Ministry of Environment, Urbanization, and Climate Change, through its Directorate of Climate Change, ensures the alignment of sectoral strategies with national climate objectives and supports the integration of adaptation measures into development planning at both national and local levels.

6.1.3 Legal Frameworks

Türkiye's adaptation efforts are guided by several key policy documents and legal frameworks, including:

- **Climate Change Adaptation Strategy and Action Plan (2024-2030):** This comprehensive plan outlines the nation's strategic approach to building resilience against climate impacts. It emphasizes integrating adaptation measures into national policies and development plans, fostering cross-sectoral cooperation, and establishing robust monitoring and evaluation frameworks. The strategy also includes sector-specific actions for urban, agriculture and food security, water resources management, public health, energy, industry, social development, tourism and cultural heritage, transportation and communication, biodiversity and ecosystem services and disaster risk reduction.

- **Local Climate Change Adaptation Strategy and Action Plans:** Developed for four pilot cities- Konya, Muğla, Sakarya, and Samsun - these plans provide a localized approach to climate adaptation. These plans incorporate region-specific climate projections and vulnerability assessments, addressing the unique climate challenges faced by each pilot city. Based on the outcomes of vulnerability and risk analyses, sector-specific adaptation actions have been identified to address the unique climate-related challenges of each city.

- **National Development Plans:** The **12th Development Plan (2024-2028)** and the **Medium-Term Program (2024-2026)** integrate climate adaptation into broader development goals, emphasizing greenhouse gas emission reductions, enhancing climate resilience, and achieving the 2053 Net Zero Emission Target. These plans align national policies with international commitments under the Paris Agreement, supporting sustainable development and economic growth while addressing climate risks. Specifically, within the 12th Development Plan, provisions such as completing and updating **Flood Management Plans** and preparing legislation to minimize the effects of floods and prevent interventions in stream beds are pivotal for managing flood risks.

- **Ministry of Agriculture and Forestry Strategic Plan (2024-2028):** This plan also highlights the goal of increasing climate change adaptation capacity and resilience. The plan integrates legal frameworks that enhance water efficiency, promote sustainable agricultural practices, and improve disaster preparedness in the agricultural sector. These objectives are aligned with national climate adaptation strategies, ensuring that legal measures are tailored to sector-specific needs.

Legal frameworks are further supported by the **Eighth National Communication** under the United Nations Framework Convention on Climate Change (UNFCCC). This report underscores Türkiye's commitment to integrating climate change policies across key sectors, including water management, agriculture, biodiversity

and ecosystem, energy, transportation, etc. It highlights the need for strong legal and policy frameworks to ensure effective climate adaptation, with a particular focus on disaster risk management, water efficiency, and biodiversity conservation.

6.2 IMPACTS, RISKS AND VULNERABILITIES

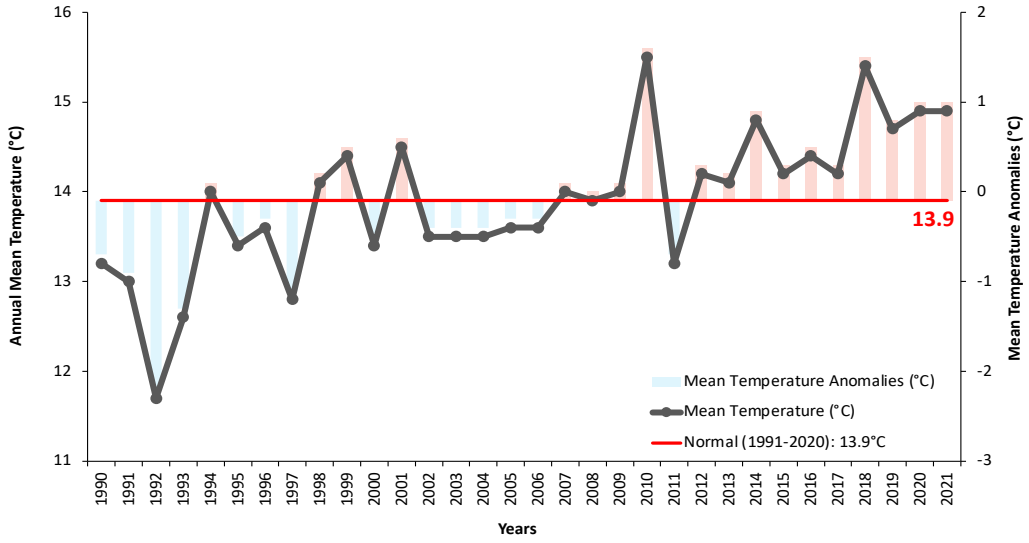
6.2.1 Impacts

6.2.1.1 Observed Impacts

The Turkish State Meteorological Service (TSMS) has compiled a set of climatological observations indicating that precipitation decreases while temperatures rise during the warmer months. According to TSMS, the long-term annual mean temperature in Türkiye for the 1991-2020 reference period, is 13.9°C, which is an increase from the 13.5°C recorded for the 1981-2010 period the 13.2°C recorded for the 1971-2000 period.[202] Additionally, Türkiye has seen positive temperature anomalies from the average temperature, since 1990 with the exception of 1992, 1997 and 2011. The year 2010 was particularly noteworthy, as it saw the highest temperature anomalies on record, with temperatures 1.6°C above the average. In 2023, Türkiye experienced its third warmest year on record. The 1991-2020 reference period indicates that the average temperature in Türkiye has increased by 1.2°C, considering the mean temperature of 13.9°C. In 2023, monthly mean temperatures were above normal except in February, March, and May. Overall, temperature differences from the average were positive in all seasons.

[202]TSMS, 2024. https://www.mgm.gov.tr/eng/Yearly-Climate/State_of_the_Climate_in_Turkey_in_2023.pdf

Figure 69 - Annual Mean Temperature of Türkiye



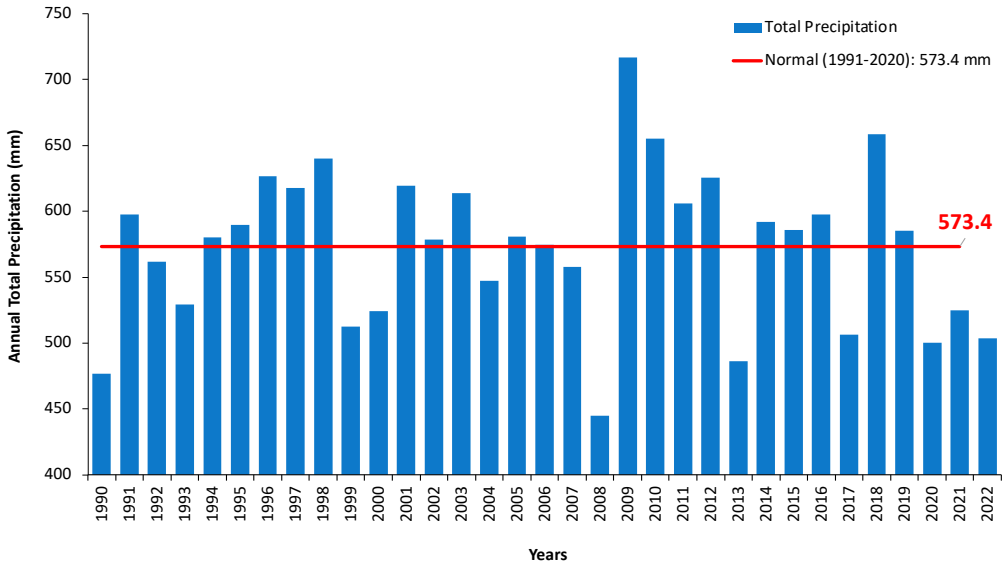
In recent decades, Türkiye has also seen some of the warmest seasons on record. For example, both the winter and summer of 2010 were the warmest on record, and the hottest spring on record occurred in 2018. The hottest fall on record took place in 2020, as shown in Table 36, which provides an overview of seasonal and annual temperature trends in Türkiye.

Table 36 - Ranking of the Seasonal and Annual Warmest Decades

Winter			Spring			Summer			Autumn			Average		
Year	Temperature	Anomaly	Year	Temperature	Anomaly	Year	Temperature	Anomaly	Year	Temperature	Anomaly	Year	Temperature	Anomaly
2010	6.5	2.6	2018	14.9	2.5	2010	25.1	1.1	2023	17.4	2.1	2010	15.5	1.6
2018	6.3	2.4	1989	14.0	1.6	2012	24.9	0.9	2020	17.4	2.1	2018	15.4	1.5
2021	5.8	1.9	2008	13.8	1.4	2016	24.8	0.8	2012	16.8	1.5	2023	15.1	1.2
2023	5.2	1.3	2016	13.7	1.3	2007	24.8	0.8	2019	16.7	1.4	2021	14.9	1.0
2011	5.1	1.2	2013	13.7	1.3	2023	24.7	0.7	2015	16.7	1.4	2020	14.9	1.0
1999	5.1	1.2	2014	13.6	1.2	2021	24.7	0.7	2010	16.7	1.4	2014	14.8	0.9
1979	5.0	1.1	2001	13.6	1.2	2017	24.7	0.7	2022	16.5	1.2	2019	14.7	0.8
2015	4.7	0.8	2010	13.4	1.0	2018	24.6	0.6	2018	16.3	1.0	2022	14.5	0.6
2013	4.7	0.8	2021	13.2	0.8	2022	24.6	0.6	1998	16.0	0.7	2001	14.5	0.6
2019	4.6	0.7	2020	13.1	0.7	2001	24.6	0.6	1994	16.0	0.7	2016	14.4	0.5

The annual mean areal total precipitation in Türkiye between 1991 and 2020 was 573.4 mm, as measured by TSMS[203] as indicated by the precipitation time series in Figure 70. The annual total precipitation averages in Türkiye have experienced a slight decrease. When reviewing long-term precipitation averages in Türkiye, it is observed that dry and wet periods follow one another. For the examined period, the year 2008 (451.6 mm) was one of the driest on record while the wettest year was 2009 (728.3 mm). In Figure 70, blue colored columns show the amount of precipitation, while the red horizontal line shows the long-term average for Türkiye.

Figure 70 - Annual Total Precipitation in Türkiye



Türkiye has experienced notable variations in precipitation patterns, as given in Table 37. The table highlights the anomalies in seasonal and annual precipitation compared to long-term averages. Positive anomalies indicate periods with above-average precipitation, while negative anomalies signify below-average precipitation. Notably, the winter of 2019 with a 42.0 mm anomaly, and the autumn of 1989, with a 61.6 mm anomaly, experienced significantly higher precipitation than average, indicating much wetter conditions. In contrast, the autumn of 2020 saw the lowest recorded precipitation anomaly at -50.4 mm, indicating an exceptionally dry season.

Considering the average annual precipitation, 2009 stands out with an exceptionally high anomaly of 27 mm, indicating that it was a particularly wet

[203] TSMS, 2024. https://www.mgm.gov.tr/eng/Yearly-Climate/State_of_the_Climate_in_Turkey_in_2023.pdf

year overall. Conversely, 2008 recorded a notably low annual anomaly of -21.3 mm, making it one of the driest years on record.

Table 37 - Ranking of the Seasonal and Annual Wettest and Driest Decades

Winter			Spring			Summer			Autumn			Average		
Year	Precipitation	Anomaly	Year	Precipitation	Anomaly	Year	Precipitation	Anomaly	Year	Precipitation	Anomaly	Year	Precipitation	Anomaly
2019	291.6	42.0	2023	249.1	45.3	1992	91.0	42.1	1989	214.4	61.6	2009	728.3	27.0
2010	291.3	41.9	1998	243.2	41.9	1999	90.3	41.0	1988	208.2	56.9	1988	716.8	25.0
2013	275.4	34.2	2011	224.2	30.8	2019	89.3	39.5	2006	193.1	45.6	1981	676.0	17.9
1981	273.1	33.0	1988	223.4	30.3	1997	86.6	35.2	1983	182.2	37.3	1987	670.8	17.0
2004	272.9	32.9	1996	212.0	23.7	1988	86.5	35.1	1994	174.1	31.2	2018	658.8	14.9
2002	265.7	29.4	1993	202.7	18.3	2018	85.7	33.8	2009	172.7	30.2	2010	645.6	12.6
2012	258.4	25.9	1991	201.3	17.5	2015	84.6	32.2	1995	170.2	28.3	1998	642.2	12.0
2009	253.2	23.3	1995	200.8	17.2	2014	83.3	30.1	2014	168.1	26.7	2023	641.5	11.9
1988	250.3	21.9	1982	198.0	15.5	2023	82.9	29.4	2023	162.6	22.6	1996	637.0	11.1
1987	249.3	21.4	1984	196.8	14.8	2002	81.6	27.4	1997	161.0	21.4	2012	626.7	9.3

6.2.1.2 Expected Impacts

Climate Change Modelling Background

As presented in the 8th National Communication of Türkiye, the Turkish State Meteorological Service (TSMS) and the Directorate General of Water Management (DGWM) downscaled regional climate projections using high-resolution models under RCP4.5 and RCP8.5 scenarios, based on the CMIP5 archive. The "Iklime Uyum Project" assessed the performance of these models in simulating Türkiye's climate, identifying the MPI-ESM-MR model with a 10 km resolution as the most accurate. Future projections for 2021-2100 were evaluated under both scenarios, revealing increasing temperatures and changing precipitation patterns across the country.

Expected Changes in Türkiye

The "Iklime Uyum Project" analyzed climate changes from the 2021-2100 projection period compared to the 1971-2000 reference period using high-resolution models under the RCP4.5 and RCP8.5 scenarios. The findings indicate that average temperatures across Türkiye are expected to rise by 2.5°C to over

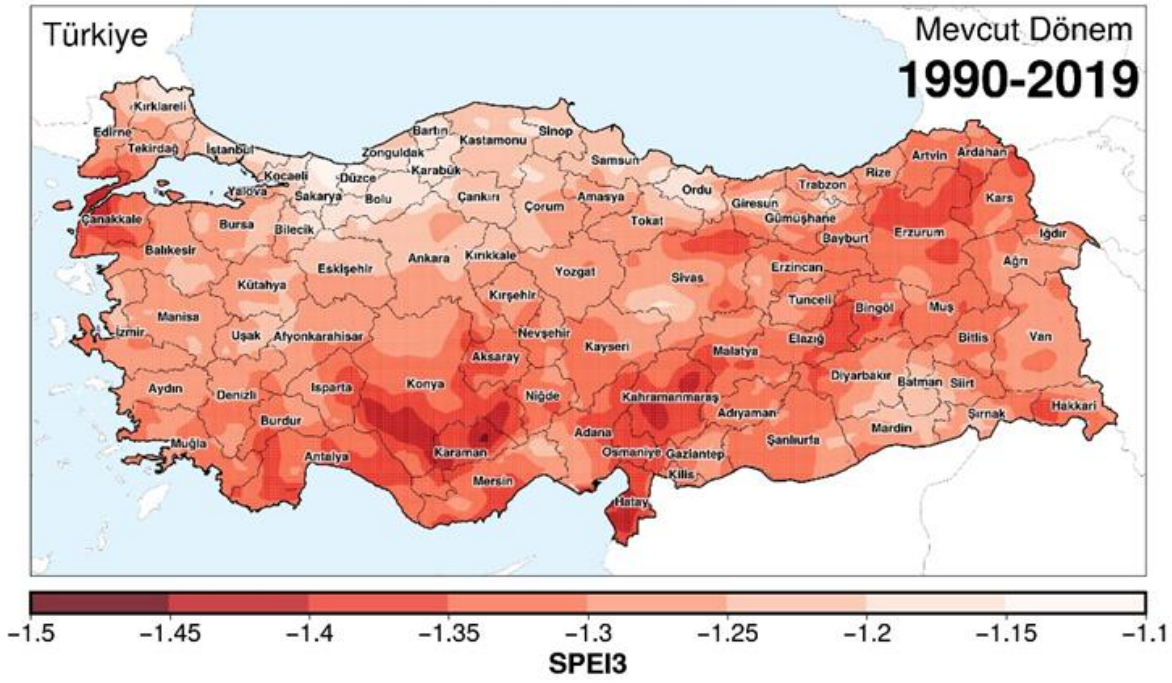
5°C by the end of the century, with the most significant warming in Eastern Anatolia. Meanwhile, precipitation patterns are projected to shift, with increases in the northern regions and a sharp decrease in the southern regions; under the RCP8.5 scenario, the Mediterranean Region could experience a reduction of up to 300 mm in total annual precipitation by the end of the century.

The "Iklime Uyum Project" is the country's first comprehensive multi-hazard assessment of climate change impacts, identifying the most vulnerable regions and sectors for the 21st century. Using high-resolution simulations, the project analyzed various climate hazards, including heat waves, cold waves, droughts, forest fires, heavy precipitation, and extreme winds. Findings indicate a significant increase in the frequency and intensity of heat waves, particularly under the RCP8.5 scenario, while cold waves are expected to decrease. Droughts are projected to become more severe, especially in the southeast, and conditions conducive to forest fires will likely increase, particularly in southern regions. Heavy precipitation is predicted to rise in northern areas and decrease in the south, while extreme wind patterns show regional variability.

Drought

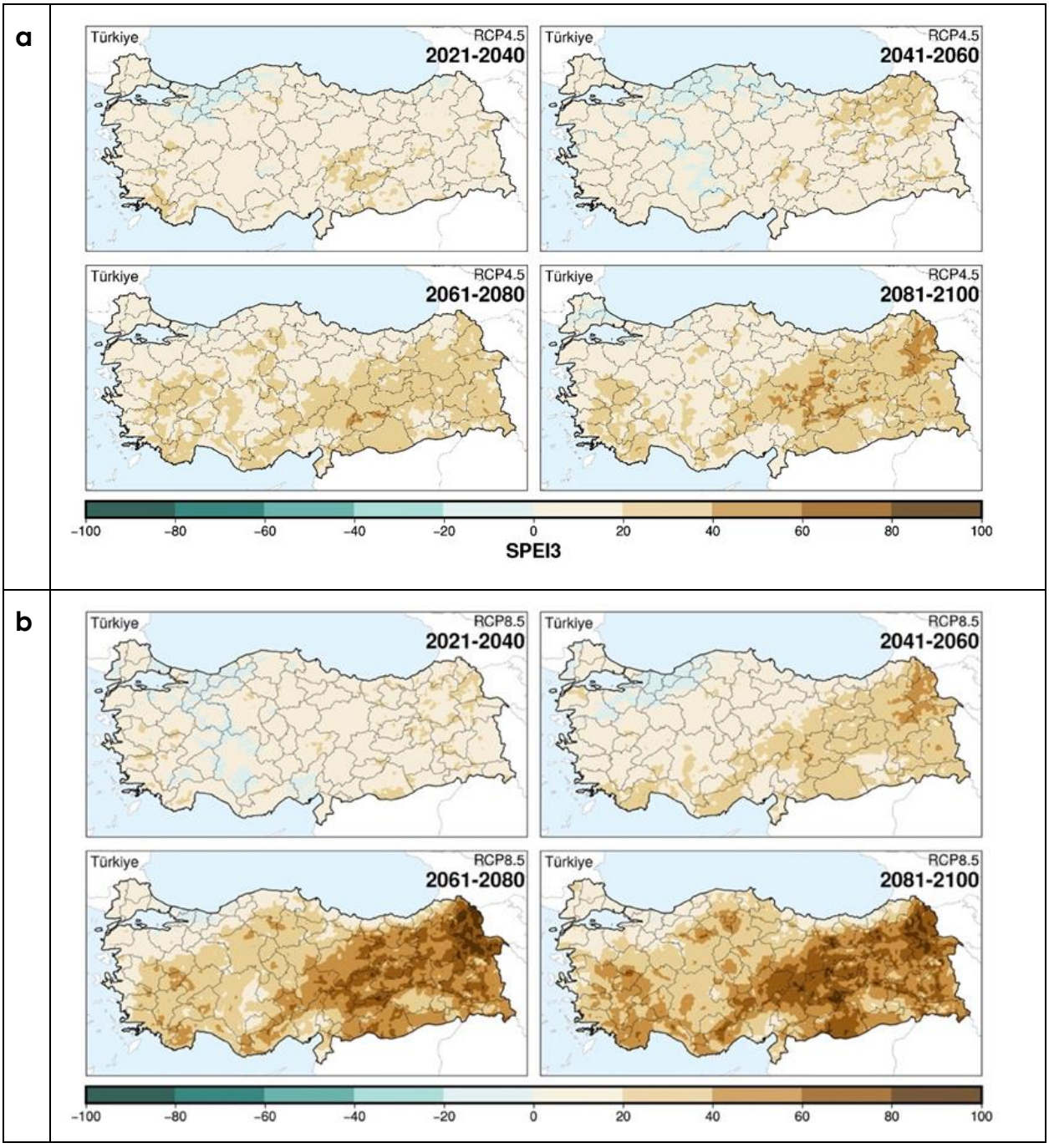
The 3-month Standardized Precipitation and Evapotranspiration Index (SPEI3) was used to assess the impact of drought. According to the results obtained, the average of the most severe drought values during the current period is shown in Figure 71. When examining the drought values calculated for the current period (1990-2019), it is evident that the intensity of drought decreases in the northwest part of Türkiye. The lowest drought values in Türkiye are observed in the Western Black Sea region. The provinces of Konya and Karaman have the highest meteorological drought values, followed by Hatay and Kahramanmaraş. Additionally, meteorological drought levels in the Eastern Anatolia and Southeastern Anatolia regions are above the average for Türkiye.

Figure 71 - The Current Period Meteorological Drought Intensity



The percentage changes in drought conditions for the future projections, compared to the reference period, are shown in Figure 72. According to the emissions scenarios referred to as relatively optimistic (RCP4.5) and pessimistic (RCP8.5), the severity of meteorological drought is expected to increase significantly toward the end of the century.

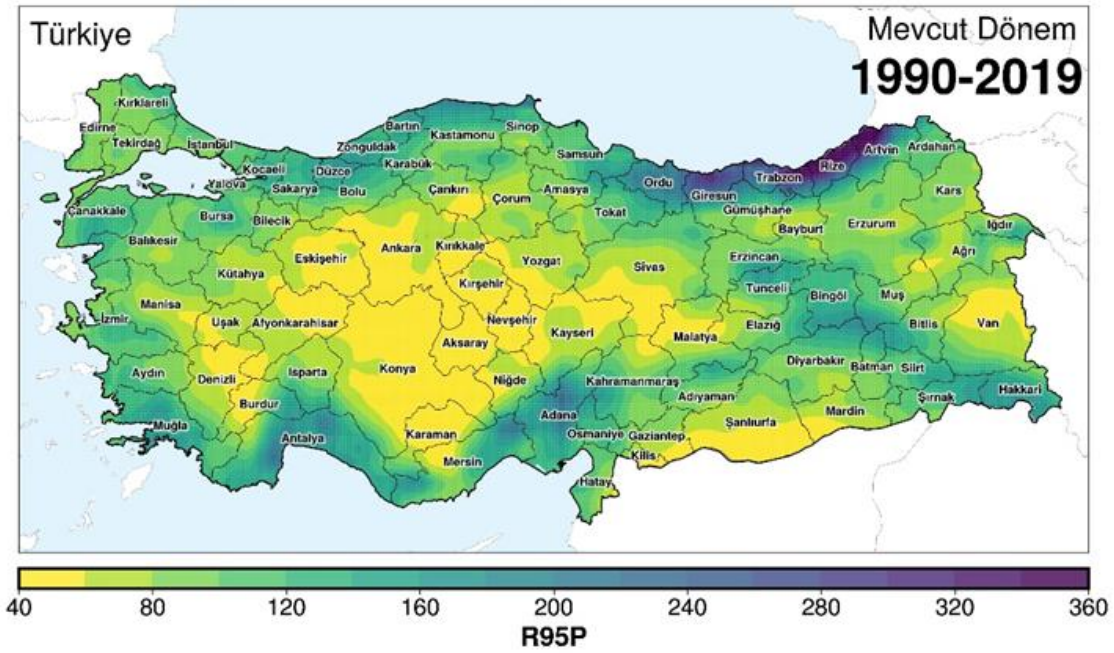
Figure 72 - According to the Reference Period a) RCP4.5 Scenario b) RCP8.5 Scenario for the Future Projections of SPEI3 Percentage (%) Changes



Extreme Precipitation

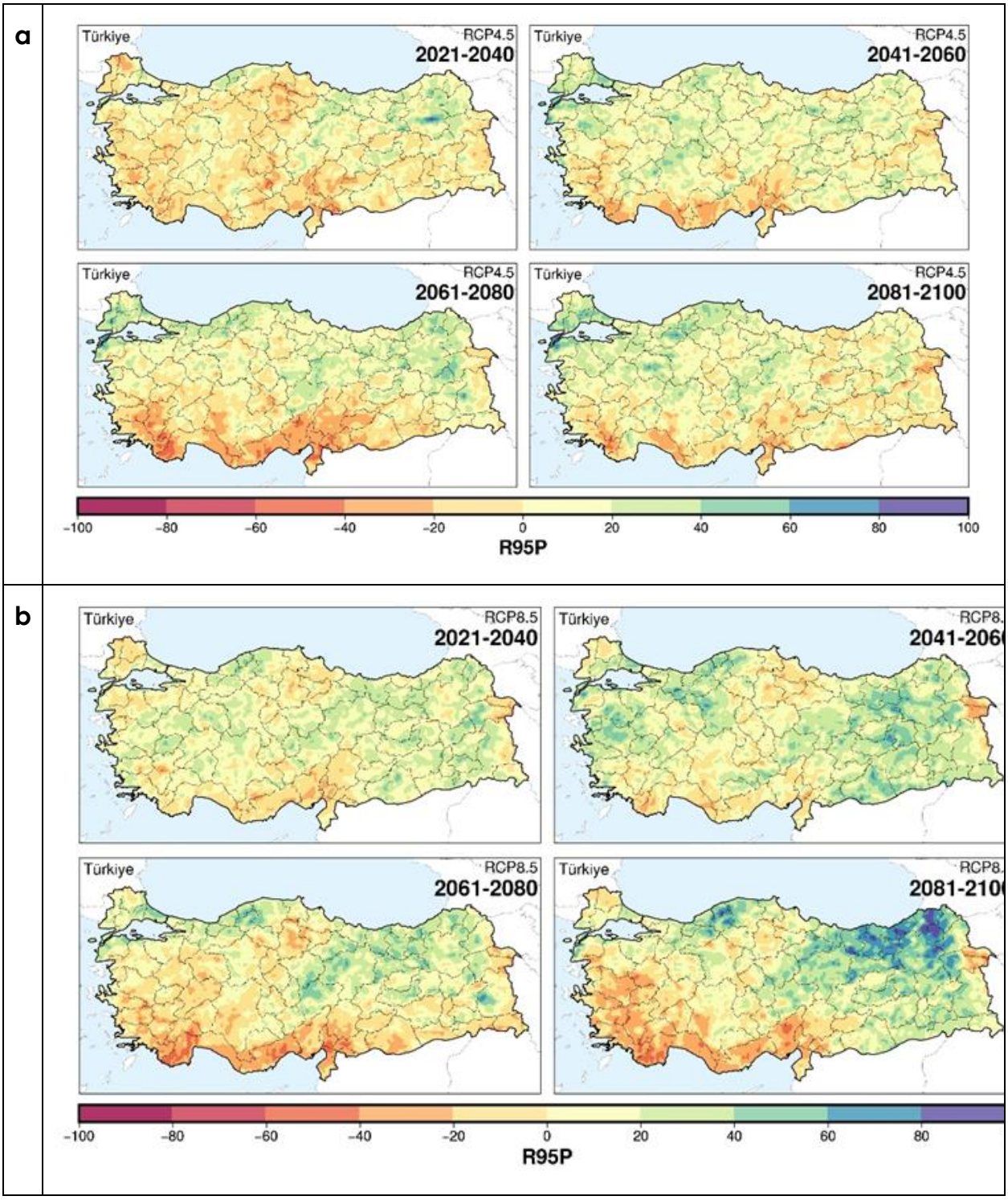
The R95P index was calculated to determine the total amount of precipitation from heavy precipitation events. The average for the current period (1990-2019) for the R95P index is shown in Figure 73. In the current situation, low values are observed in the Central Anatolia Region, while the Eastern Black Sea and Mediterranean regions show significantly higher values. The total amount of precipitation in Central Anatolia, as well as in the provinces of Van, Denizli, and Burdur, does not exceed 60 mm. In the Southeastern Anatolia Region, particularly in the provinces of Şanlıurfa, Mardin, Gaziantep, and Kilis, total precipitation is between 40 and 60 mm. In contrast, the total heavy precipitation in the Mediterranean Region reaches 280 mm, and in the Eastern Black Sea Region, this value increases to 360 mm.

Figure 73 - The Current Period Heavy Precipitation (mm)



The reference period is shown in Figure 74. When analyzing the future projections, both scenarios generally predict an increase in the total heavy precipitation in northern Türkiye, while a decrease is expected in the south. According to the RCP 4.5 scenario, the most significant decrease is anticipated in the Mediterranean region during the 2061-2080 period. Similarly, according to the RCP 8.5 scenario, the most severe decrease is expected to occur in the Mediterranean region during the 2081-2100 period.

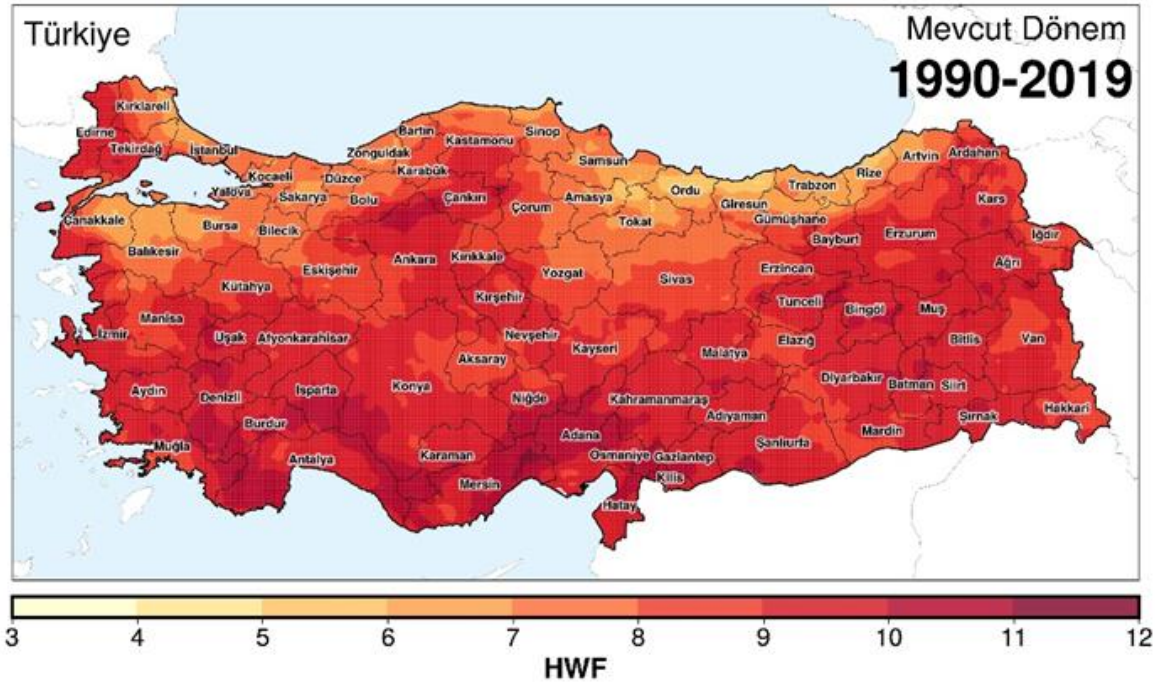
Figure 74 - According to the Reference Period a) RCP4.5 Scenario b) RCP8.5 Scenario for the Future Projections of R95P Changes



Heatwaves

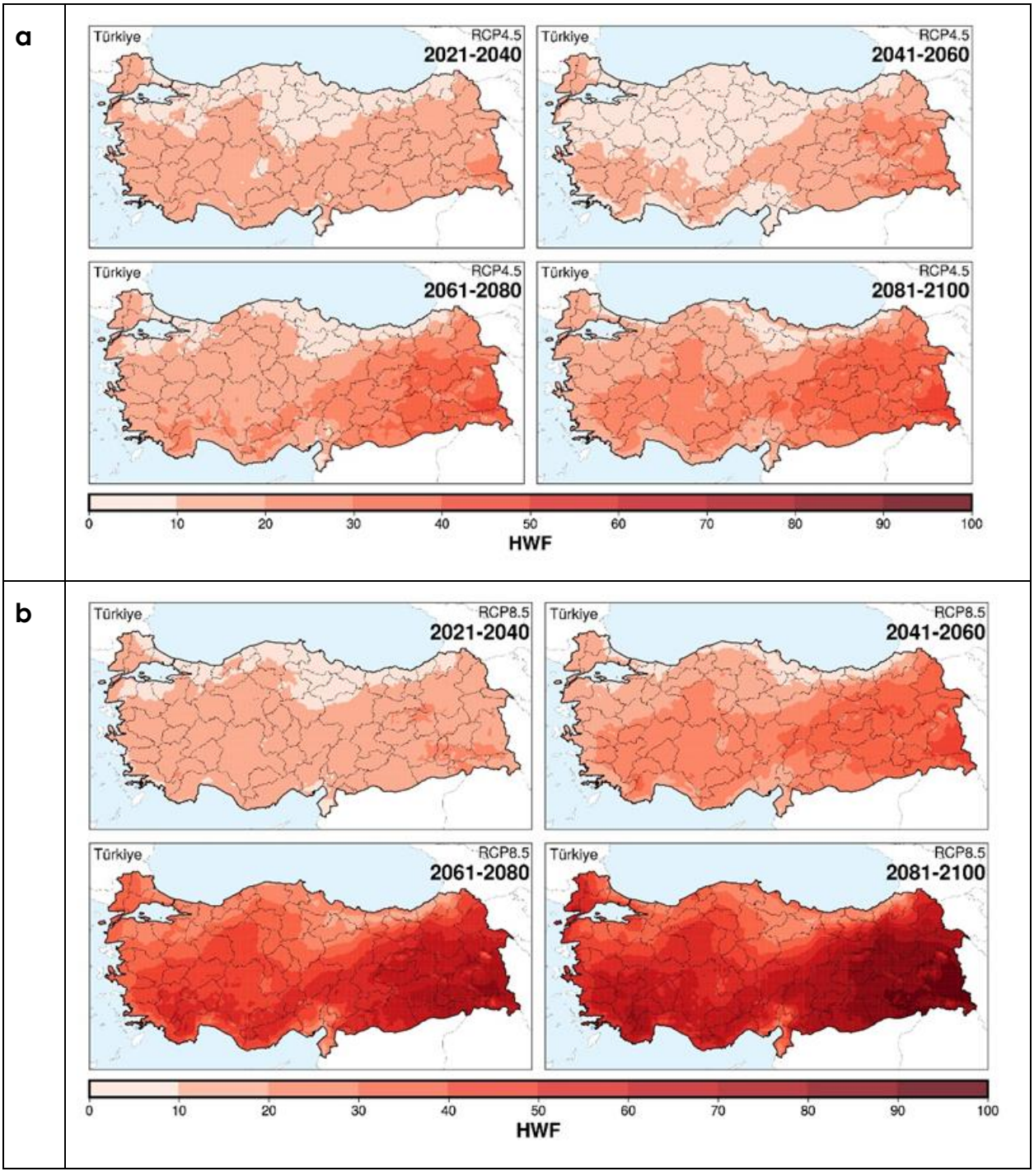
The Heatwave Frequency (HWF) index was examined to assess the hazard of heatwaves as calculated above 90th percentile of temperature. A period in which the index is observed for at least 5 days, or more was considered as a heatwave frequency. The distribution of the HWF for the current period is shown in Figure 75. According to the analysis results, at least three instances of heatwave events are observed in Türkiye. The lowest frequency of heatwaves is recorded in the provinces of Ordu and Giresun. In contrast, the highest frequency of heatwaves is found in Mersin, where it reaches 12 days per year. It is noted that, particularly in northern Türkiye, the frequency of heatwaves is low, but increases to the south.

Figure 75 - Current Period Heatwave Frequency (day)



Future projections according to the reference period are shown in Figure 76 for the RCP4.5 and RCP8.5 scenarios. When examining these future changes, both emission scenarios indicate that, alongside rising temperatures, the frequency of heatwave events will increase significantly during the last 20 years of the 21st century. Particularly in the South Aegean and Mediterranean regions, it is expected that the total number of heatwave days will increase by approximately 60 days under the RCP4.5 scenario by the 2060s, while this increase could reach up to 100 days under the RCP8.5 scenario. Overall, it is estimated that the change in heatwave frequency across Türkiye will be most significant according to the RCP8.5 scenario, with an increase of nearly five times compared to the early part of the century.

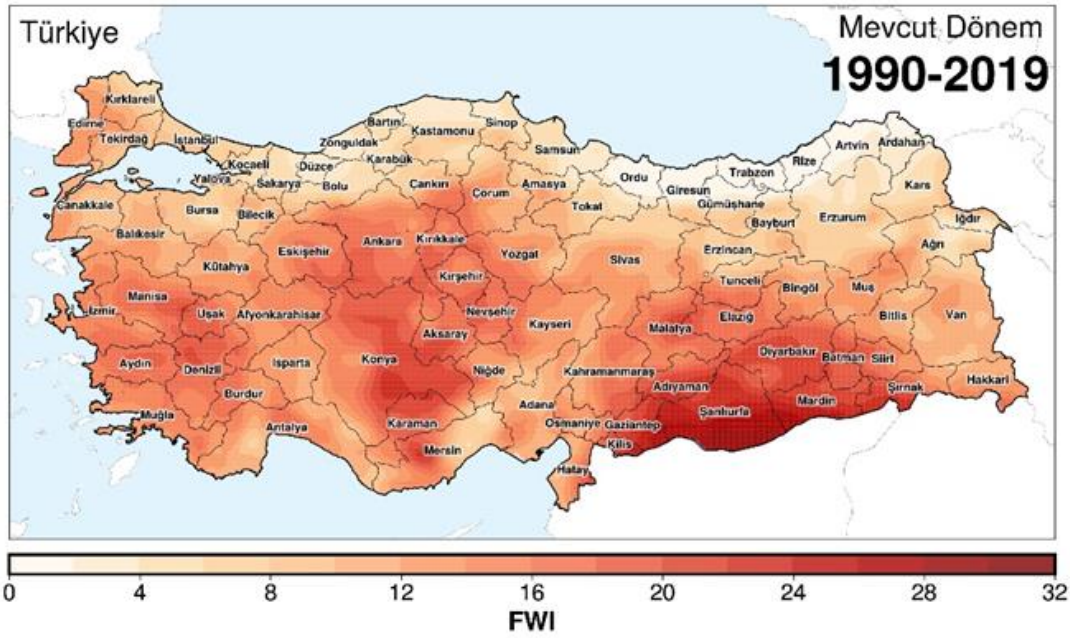
Figure 76 - According to the Reference Period a) RCP4.5 Scenario b) RCP8.5 Scenario for the Future Projections HWF Frequency



Forest Fire

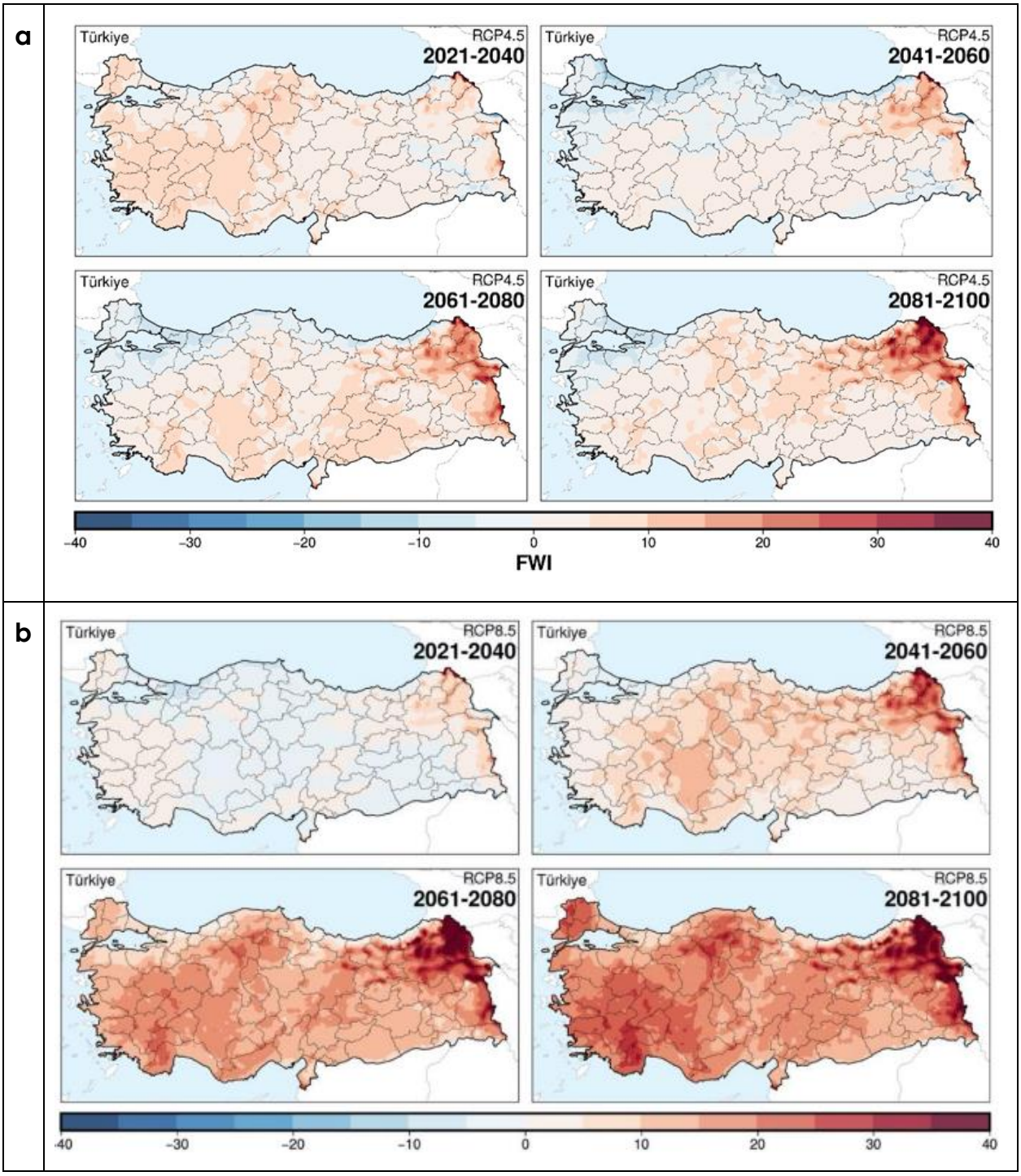
The Canadian Fire Weather Index (FWI), which represents fire-conducive weather conditions for forest fire risk, has been calculated, and the areal distribution of the average FWI values for the current period is shown in Figure 77. According to the FWI index, the Black Sea Region, with the lowest values in the current period, is classified as low risk for fire, while the Southeastern Region is at high risk. The Aegean, Marmara, and Eastern Anatolia Regions fall into the medium-low fire risk categories.

Figure 77 - Current Period Forest Fire Weather Index (FWI)



Future projections percentage changes according to the reference period are shown in Figure 78 for the RCP4.5 and RCP8.5 scenarios. Examining the results for the future projections, a change of approximately ±20% is expected across Türkiye over the next 100 years according to the RCP4.5 scenario. Fire-conducive weather conditions are projected to increase by 30%, particularly in the provinces of Antalya and Burdur in the Mediterranean Region and in Çankırı and Çorum in Central Anatolia. In the Southeastern Anatolia Region, which currently has a high fire risk, the amount of change is predicted to increase by 20% by the end of the next century.

Figure 78 - According to the *R*eference *P*eriod a) RCP4.5 *S*cenario b) RCP8.5 *S*cenario for the *F*uture *P*rojections FWI Changes *(%)*



6.2.2 Vulnerability and Risk Assessment

As highlighted in the 8th National Communication of Türkiye, social and economic losses from weather and climate-related extreme events are increasing, with notable regional variability. Türkiye, located in a subtropical Mediterranean climate zone, faces medium to high climate change risks. The "Enhancing Adaptation Action in Türkiye Project" (Iklime Uyum Project), led by the Ministry of Environment, Urbanization and Climate Change (MoEUCC), conducted the first comprehensive national vulnerability and risk assessment across ten sectors, including water management, agriculture, and public health, considering both current (1990-2019) and future (2021-2100) periods under RCP4.5 and RCP8.5 scenarios. Additionally, the "Climate Promise Project," also by MoEUCC, developed sectoral risk analyses and nature-based solutions for regional adaptation, while the "Climate Change Disaster Management Project," implemented by the Disaster and Emergency Management Presidency (AFAD), prepared multi-layered hazard maps and national-scale vulnerability analyses.

6.2.2.1 Water Resources Management

As highlighted in the 8th NC, the water resources in Türkiye are highly vulnerable to climate change impacts, particularly drought and heavy precipitation. The findings from the vulnerability and risk assessment show that drought risk is currently high or very high in regions such as Western Marmara, Central Anatolia, Eastern Mediterranean, Southeastern, and Eastern Anatolia, and is expected to remain similar in the future. The risk of heavy precipitation is extremely high in the Eastern Mediterranean, Black Sea coastal provinces, and parts of the Marmara, Mediterranean, and Aegean regions, with risks projected to increase significantly, especially in northern Marmara after the 2060s.

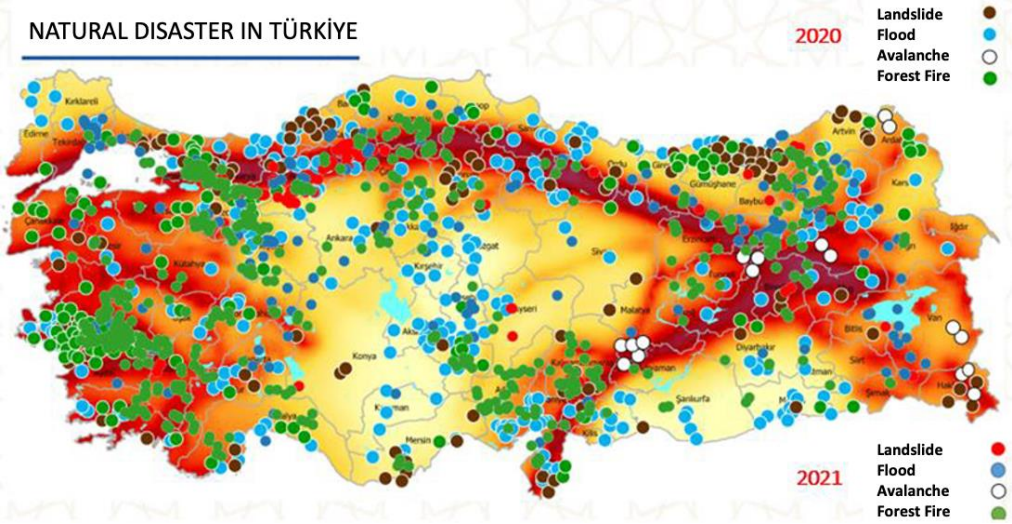
6.2.2.2 Agriculture and Food Security

As mentioned in the 8th NC, Türkiye is also highly vulnerable to climate change impacts on agriculture and food sector due to its geographic location. Vulnerability and Risk Assessment study shows that the western and eastern parts of Central Anatolia, Eastern Anatolia, and parts of the Eastern Mediterranean currently face high or very high drought risks for crop yields, with risk expected to increase in the eastern Aegean. In the livestock sector, drought risks are high in Eastern and Southeastern Anatolia, Central Anatolia, and the Mediterranean coasts, and are projected to expand across much of the southern half of the country in the future.

6.2.2.3 Disaster Risk Management

As mentioned in the 8th National Communication (NC), Türkiye faces significant exposure to various natural hazards due to its geographical and climatic conditions. These hazards include earthquakes and climate-related events such as floods, landslides, droughts, and wildfires. In recent years, major flood events have occurred in the Western and Eastern Black Sea regions, while wildfires have notably impacted the Southern Aegean and Mediterranean regions. Flood risks are increasing, particularly in basins such as Kızılırmak and Yeşilırmak. Landslides are frequent in the Eastern Black Sea region, and forest fires are increasingly affecting areas like Antalya and Muğla due to extreme temperatures. The "Disaster Profile in Türkiye" map is given the Figure 79 (AFAD, 2022)[204] illustrates the spatial distribution of these natural hazards across the country in 2020 and 2021.

Figure 79 - Disaster Profile in Türkiye



6.2.2.4 Biodiversity and Ecosystem Services

Biodiversity and ecosystem services in Türkiye are highly impacted by climate change, especially due to drought risk. Vulnerability and risk studies show that species diversity is at very high risk of drought in regions such as Eastern Mediterranean, Southern Central Anatolia, and Northern Eastern Anatolia. Carbon storage is also highly vulnerable, particularly in the eastern Black Sea, Western Marmara, and Western Mediterranean regions. Wetland ecosystems in

[204] AFAD, 2022. Mid-Term Review of the Sendai Framework: National Report of Türkiye. p.6

Central, Eastern, and Southeastern Anatolia face the highest drought risks, which could lead to a decline in biodiversity, reduced ecosystem services, and increased reed fires in high-risk areas.

6.2.2.5 Coastal Areas

The coastal areas of Türkiye are under pressure from population density and extensive migration. Climate change is expected to have a significant impact on coastal areas and result in an increase in sea water temperature, level, and acidification, and a decrease in oxygen concentration. These changes threaten marine ecosystems, with effects such as declining seagrass and coral populations and the migration of invasive species. Coastal cities and tourist areas, which rely on underground water reserves, also face risks like saltwater intrusion. The Coastal Vulnerability Index (CVI) is used to assess risks from sea level rise, with regions like Adana, Çanakkale, Samsun, Balıkesir, and Aydın identified as high-risk areas for land loss.

6.2.2.6 Public Health

As highlighted in the 8th NC, climate change is projected to increase the prevalence of infectious and vector-borne diseases such as malaria and dengue, along with zoonotic diseases like rabies and TB. Health impacts from air pollution, heatwaves, and coldwaves are also expected to rise, leading to more respiratory, cardiovascular, and mental health issues. Water and food safety concerns will likely contribute to an increase in waterborne diseases and food contamination. Heatwave risk is currently highest in the Eastern Mediterranean, Southeast, and Southern Eastern Anatolia, and is expected to intensify, highlighting the need to strengthen healthcare capacity in these regions.

6.2.2.7 Urban Areas

In Türkiye, urban areas are increasingly vulnerable to climate hazards due to rapid population growth and expansion into risky locations. Cities in the Black Sea region, in particular, are prone to heavy precipitation and flooding, while coastal cities in the Mediterranean and Aegean regions face threats from heavy rainfall and windstorms. Heatwaves also pose a severe risk, especially in southern cities with dense populations and few natural areas. Current assessments show high or very high risks of heavy precipitation in cities along the Black Sea, Aegean, Mediterranean, and Southeastern Anatolia, with heatwave risks concentrated in the southern half of the country. These risks are expected to increase in the future.

6.2.2.8 Tourism and Cultural Heritage

Climate change is expected to significantly impact Türkiye's tourism sector, especially in the southern Aegean, Mediterranean, and Central Anatolian regions, where heatwaves pose an extremely high risk. These regions, along with the southeastern part of the country, are particularly vulnerable, which could negatively affect tourist satisfaction, income, and employment. Wildfires in 2021 damaged natural heritage sites and flooding due to heavy precipitation poses a growing risk, particularly in coastal and steep areas. These climate hazards could lead to a decline in tourism and a reduction in the variety of touristic activities.

Cultural heritage sites are also highly vulnerable, with heatwaves and moisture accelerating degradation of monuments and archaeological sites. The 2023 floods in southern Türkiye demonstrated the risks to multi-layered heritage sites, museums, and archives, where damage to artifacts could be irreversible. Protecting Türkiye's cultural heritage is vital for preserving its historical and religious significance and sustaining tourism, which is a key part of the country's economy.

6.2.2.9 Energy

As given in the 8th NC, climate change is expected to affect Türkiye's energy sector by impacting energy resources, infrastructure, and demand. Heatwaves can increase peak electricity demand and damage energy transmission lines, while drought threatens water-dependent hydroelectric power plants, particularly in Southeastern and Eastern Anatolia. Heatwave risk is currently highest in southern provinces, with future risk expected to increase in Eastern and Southeastern Anatolia. Additionally, vulnerability assessments are being conducted for Türkiye's nuclear power plants, such as Akkuyu Nuclear Power Plant (NPP), to ensure resilience against climate-related hazards like flooding and extreme weather events.

6.2.2.10 Industry

Climate change poses significant risks to Türkiye's industrial sector, especially from extreme weather events like drought, heavy precipitation, and heatwaves. Industries that rely on agriculture and water resources are particularly vulnerable. Current vulnerability and risk assessments show that heavy precipitation risks are high in industrial zones near the Black Sea, Aegean, and Mediterranean regions, and drought risk is extremely high in Central Anatolia, the Eastern Mediterranean, and Southeastern Anatolia. These risks are expected to persist and increase in the

future, especially in the Aegean region. Adaptation measures are essential to strengthen the sector's resilience.

6.2.2.11 Transportation and Communication

As highlighted in the 8th NC, climate change significantly impacts transportation and communication infrastructure in Türkiye, affecting all sectors of the economy. Vulnerability and risk assessments show that heavy precipitation poses high and very high risks, especially along the central and eastern Black Sea, Aegean, and Mediterranean coasts. Heatwaves also present high risks, particularly in western and southern Türkiye, with risks expected to increase in the future. Ports, crucial for external trade and economic growth, are highly vulnerable to sea-level rise, storm surges, and other climate hazards, making their climate resilience a strategic priority.

6.3 ADAPTATION PRIORITIES AND BARRIERS

6.3.1 Adaptation Priorities for Climate Change in Türkiye

Türkiye is actively addressing the challenges posed by climate change through a comprehensive set of adaptation strategies, prioritizing key sectors such as water resources, agriculture, disaster risk management, biodiversity and ecosystem services, tourism and energy. Türkiye's approach involves collaborative efforts across various governmental institutions, each contributing to enhancing resilience and sustainable management of natural resources.

6.3.1.1 National Adaptation Initiatives

The **Enhancing Climate Adaptation Action in Türkiye Project** has successfully updated **Türkiye's Climate Change Adaptation Strategy and Action Plan**, a key national initiative. This update was informed by comprehensive vulnerability and risk assessments, ensuring that climate change policies are grounded in a robust understanding of the climate risks and vulnerabilities across different sectors and regions. In addition to these national-level efforts, the project focused on local adaptation by conducting vulnerability and risk assessments in four pilot provinces. These analyses are foundational to the development of **Local Climate Change Adaptation Strategy and Action Plans**, enabling municipalities and regions to effectively address climate change challenges unique to their areas.

The project places special emphasis on 11 key sectors: Agriculture and Food Security, Biodiversity and Ecosystem Services, Water Resources Management, Tourism and Cultural Heritage, Industry, Urban Development, Social Development, Public Health, Transportation and Communications, Energy, and

Disaster Risk Reduction. Through detailed studies in these sectors, the project ensures that adaptation strategies are comprehensive and tailored to the specific needs of each area, strengthening the resilience of both national and local communities against climate change impacts.

The **EU Partnership for Local Climate Action in Türkiye** aligns closely with Türkiye's national adaptation priorities as outlined under **Article 7 of the Paris Agreement**, which emphasizes enhancing adaptive capacity, reducing vulnerability, and promoting sustainable development. Türkiye's commitment to these principles is reflected in its **12th Development Plan (2024-2028)** and the **Medium-Term Program (2024-2026)**, both of which highlight the importance of reducing greenhouse gas emissions and strengthening climate adaptation.

This project supports Türkiye's national priorities by focusing on key areas such as **water management**, **disaster risk reduction**, and **sustainable urban development**. A central feature is the preparation of **Local Climate Change Action Plans** for pilot cities, which include strategies to mitigate climate-related risks such as floods and heatwaves, directly contributing to disaster risk reduction - a national priority.

In terms of water management, the project develops climate change projections and vulnerability assessments at the **NUTS-1 level**, addressing the growing concern of **water scarcity** in Türkiye. By promoting nature-based solutions and sustainable agricultural practices, the project aligns with the country's broader adaptation goals, supporting efforts to ensure **sustainable water resources** in the face of climate change.

The project also reinforces Türkiye's **2053 Net Zero Emission Target** by integrating climate adaptation into the country's **National Contribution Declaration (NDC)**. Through enhancing local capacities, providing grants, and developing legal and institutional frameworks, the project ensures that adaptation actions are sustainable in the long term, helping Türkiye meet its obligations under the Paris Agreement while addressing regional and community-specific vulnerabilities.

6.3.1.2 Water Resources Management

Water resources management is one of Türkiye's foremost adaptation priorities due to the increasing scarcity of water, exacerbated by climate change. To address this growing challenge, the **Ministry of Agriculture and Forestry**, the **Directorate General of Water Management (DGWM)**, and the **General Directorate of State Hydraulic Works (DSI)**, in collaboration with **TUBITAK-MAM**, have initiated several projects aimed at enhancing water efficiency and management. These

efforts are critical for maintaining the balance between water supply and demand across various sectors, including municipal, industrial, agricultural, and individual uses. This also includes efforts to mitigate the impacts of climate change on water availability and water use and enhancing the country's ability to manage water-related disasters.

One of the most comprehensive initiatives in this regard is the **Climate Change Impact on Water Resources Project**, **launched** by DGWM **in 2013** and **completed in 2016**. This project assesses the impact of climate change on surface and groundwater resources across Türkiye's 25 river basins, using high-resolution climate models under RCP4.5 and RCP8.5 scenarios. By modeling future climate scenarios, the project aims to understand the impacts of climate change. The result of this initiative was the creation of a **Climate Water Database**, which serves as a critical tool for informing adaptation strategies and future planning for water resource management. Hydrometeorological parameters such as surface flow and water potential are analyzed, guiding policy and decision-making regarding water use and conservation efforts.

In May 2023, the **Water Efficiency Strategy Document and Action Plan (2023-2033)** was published by DGWM as part of Türkiye's broader strategy to safeguard its water resources. This document outlines detailed objectives and targets aimed at reducing water losses and enhancing water efficiency by 2030 and 2050. Specific goals include reducing water losses in drinking water systems from the current 32% to 25% by 2030 and to 10% by 2050. In agriculture, which consumes the majority of Türkiye's water resources, the strategy aims to increase the efficiency of water usage from 50% to 65% by 2050. The strategy also promotes the use of alternative water sources, such as treated wastewater and rainwater harvesting, and introduces measures to reduce individual water consumption from 150 liters per day to below 100 liters by 2050. In **2023 The Water Efficiency Campaign**, launched by DGWM alongside this strategy, promotes zero-water-loss practices and emphasizes water conservation across urban, agricultural, and industrial sectors. This campaign is pivotal in raising public awareness and encouraging responsible water use to mitigate the risks posed by climate change to Türkiye's water resources.

The **Türkiye Irrigation Modernization Project**, another key initiative, focuses on improving irrigation efficiency through the rehabilitation of outdated infrastructure, **launched** by DSI **in 2019** for a **duration of six years**. This project seeks to transition from open-channel irrigation systems, which are prone to significant water loss, to closed-channel and pressurized systems. This upgrade is essential for

reducing water losses and improving the sustainability of agricultural practices. Solar-powered groundwater extraction systems are also being introduced as part of this project, which aligns with both climate adaptation and mitigation goals by reducing the reliance on fossil fuels for water pumping. This project has been implemented in regions like Atabey, Ereğli-İvriz, Alaşehir, and Uzunlu, showcasing its widespread applicability and impact.

The Project to Enhance Water Circularity and Efficiency in Türkiye, launched by DSI in **2023** for a **duration of seven years**, aims to improve wastewater services, enhance irrigation service efficiency, strengthen institutional capacity, and improve coordination for managing water circularity. The project addresses challenges related to water scarcity by incorporating activities focused on the reuse of treated wastewater and resource recovery in water-stressed basins. Specific components include wastewater collection and reuse, the rehabilitation and modernization of irrigation systems, institutional strengthening, and capacity building. The project is currently in its preparation stage, with the objective of reducing water losses in irrigation, transitioning to more energy-efficient irrigation systems, and employing modern treatment technologies.

The **Adaptation to Climate Change in Water Resources Project** launched by DGWM in **2021** and **completed in 2023**, aimed at enhancing water efficiency through rainwater harvesting and greywater reuse in 30 metropolitan municipalities. The project included cost-benefit analyses and the implementation of 10 pilot projects—5 on rainwater harvesting and 5 on greywater reuse. In addition to these pilot projects, the initiative provided practical solutions to reduce reliance on freshwater resources, including proposals for water efficiency measures. Training programs for local administrations and guidance documents were also delivered as part of the project, further supporting Türkiye's efforts to address increasing water demand in urban areas.

To address the increasing frequency and severity of droughts, Türkiye has developed **Drought Management Plans** for all 25 river basins. These plans, launched by DGWM and **completed in 2023**, provide a comprehensive framework for reducing the country's vulnerability to droughts. The plans are built around proactive drought forecasting, water conservation techniques, and adaptive water management practices. By focusing on preemptive measures, these plans ensure that Türkiye's water resources are protected during extended dry periods, a challenge that is expected to worsen due to climate change. Key

priorities of these plans include developing legal and institutional capacities for drought management, improving water use efficiency, raising awareness about drought risks, and reducing social, economic, and environmental damages caused by droughts.

In response to flood risks, Türkiye has established a **Flood Forecasting and Early Warning System** in **15 pilot sub-basins** as part of the project named **Flood Forecasting and Early Warning System in Pilot Sub-Basins (TATUS)** by DGWM. This initiative aims to create national flood forecasting systems, provide real-time hazard mapping for **five river basins**, and is set to expand to additional river basins between **2024 and 2026**. Complementing this effort, **Flood Management Plans** have been developed for all **25 basins**, focusing on minimizing flood impacts through legal frameworks and detailed flood hazard maps. Flood hazard and risk maps for residential and economic areas have already been prepared for all basins.

In regions where snowmelt plays a critical role in annual water availability, such as the Upper Euphrates Basin, the **Assessment of Climate Change Impacts on Snowmelt and Streamflow Project** was **launched** by DGWM **in 2018** and **completed in 2019** to analyze the effects of reduced snow cover on water availability. Using advanced climate models, this project projected snowmelt changes by 2100, offering essential insights for managing water resources in snow-dependent regions of Türkiye. This project is critical for informing future water management strategies, especially in basins where snowmelt constitutes a significant portion of annual water inflows.

Türkiye has also made substantial progress in the development of **River Basin Management Plans (RBMPs)** in the responsibility of GDWM. These plans, which integrate climate change projections, ensure the sustainable and equitable sharing of water resources across different sectors. **By 2024**, RBMPs had been completed for 12 of Türkiye's 25 river basins, including Meriç Ergene, Susurluk, Konya, Gediz, Küçük Menderes, and Sakarya. The preparation of these plans for the remaining basins is ongoing, and they will eventually cover all of Türkiye's River basins. These plans are essential for long-term water sustainability, especially in balancing the competing demands of agriculture, industry, and urban water users.

In parallel with the RBMPs, **Sectoral Water Allocation Plans (SWAPs)** are also being developed by DGWM to ensure the fair distribution of water among sectors. These plans, which are critical for maintaining sectoral water needs while addressing the impacts of climate change, had been completed for 11 basins **as of 2024**. They

are a key component of Türkiye's adaptive water management strategy, ensuring that each sector receives its fair share of water while optimizing resource use in the face of climate uncertainty.

The **HİDROTÜRK Model Project**, **initiated in 2020** by TÜBİTAK-MAM, plays a key role in Türkiye's water management system by modeling hydrological, hydrogeological, and ecological conditions across the country's river basins. This project supports effective decision-making regarding water allocation, flood management, and drought preparedness by integrating data-driven approaches into water resource planning. HİDROTÜRK's real-time monitoring capabilities provide critical support for the sustainable management of Türkiye's water resources, making it a vital tool for anticipating the impacts of climate variability.

In response to the increasing demand for water storage solutions, Türkiye has embraced nature-based adaptation approaches, such as the **Groundwater Artificial Recharge** and **Underground Dams Action Plan**. **By the end of 2023**, 121 underground dams had been completed in regions such as İzmir, Aydın, and Konya, providing crucial support for groundwater reserves. These underground dams are designed to enhance natural water storage, contributing to Türkiye's resilience against prolonged droughts and water shortages, particularly in semi-arid regions.

Türkiye has also focused on increasing the reuse of treated wastewater as part of its circular economy principles. The **Treated Wastewater Reuse Initiative** aims to raise the reuse rate of treated wastewater to 15% by 2030. By 2022, the reuse rate had already reached 4.75%, surpassing initial goals. This initiative supports the sustainable use of water resources by recycling treated wastewater for agricultural irrigation, industrial processes, and landscape irrigation, alleviating pressure on freshwater supplies.

In addition to structural measures for flood control, the **Flood, Failure, and Intervention Spatial Information System (TAMBIS)** application, developed within the framework of non-structural measures and open to citizens, has been put into use. Additionally, DSI has initiated work in pilot basins for the installation of the **Flood Early Warning System (TEUS)** across the country. **By the end of 2023**, DSI's flood protection efforts had safeguarded 1,972,418 hectares of land with the construction of 8,947 flood protection facilities and 68 storage facilities.

6.3.1.3 Agriculture and Food Security

Agriculture is a critical sector in Türkiye, particularly vulnerable to the impacts of climate change, including prolonged droughts and erratic rainfall, which pose significant threats to food security and agricultural productivity. To address these challenges, the **Ministry of Agriculture and Forestry (MoAF)**, the **General Directorate of Agricultural Reform**, the **Agriculture and Rural Development Support Institution (TKDK)**, the General Directorate of Agricultural Reform, the **General Directorate of Fisheries and Aquaculture, the Ministry of Environment, Urbanisation and Climate Change (MoEUCC) the General Directorate of Combating Desertification and Erosion and the Directorate of Climate Change** have implemented several projects and strategies aimed at promoting climate-smart agriculture and sustainable food production.

Türkiye has responded to these challenges by promoting climate-smart agricultural practices through programs such as **Instrument for Pre-Accession Assistance Rural Development (IPARD) Programme (IPARD) II and III**, managed by the Agriculture and Rural Development Support Institution (TKDK). These programs focus on modernizing irrigation systems, promoting sustainable farming practices, and introducing nature-based solutions like agroforestry and crop rotation to enhance agricultural resilience.

The **Soil Organic Carbon Project (TOK)** led by the General Directorate of Combating Desertification and Erosion, plays a pivotal role in promoting sustainable land practices in Türkiye. This initiative equips farmers with critical data on soil health, encouraging sustainable land management practices that not only improve crop yields but also enhance carbon sequestration. Furthermore, this project focuses on harmonizing national soil data which is a crucial aspect of climate mitigation and adaptation efforts. A national soil carbon database has been developed to support climate-smart land use practices. In conjunction with this, the **Agricultural Drought Combat Strategy and Action Plan (2023-2027)** implemented by General Directorate of Agricultural Reform and the **Climate Change Adaptation Strategy and Action Plan (2024-2030)** published by Directorate of Climate Change, emphasize agricultural biodiversity as an essential adaptation strategy. They advocate for the conservation of agricultural resources and the use of resilient crop varieties to withstand climate variability. Furthermore, initiatives such as **rainwater harvesting** and **greywater reuse** are being promoted in metropolitan areas to tackle water scarcity and improve agricultural productivity.

Efforts to boost water efficiency in agriculture have been bolstered by the **Regulation on Control of Water Use in Irrigation Systems and Reducing Water Losses**, which was enacted by the Ministry of Agriculture and Forestry (MoAF) **in 2017**. This regulation, along with the **Water Efficiency Strategy Document and Action Plan**, aims to increase irrigation efficiency to 60% by 2030, supported by a **Guidance Document on Irrigation Efficiency which has been prepared and published on the official website of the Water Efficiency Campaign and MoAF**.

Moreover, the **TARSIM Agricultural Insurance Pool**, established under the **Agricultural Insurance Law (Law No. 5363)**, has become a key tool in protecting farmers from climate-related risks. Between 2006 and 2022, insured amounts surged from 70.7 billion TL to 296.1 billion TL, while indemnities rose from 2.3 billion TL to 3.16 billion TL, reflecting the sector's growing vulnerability to climate change. **In 2023**, these figures further increased, with insured amounts reaching 683.3 billion TL and indemnities amounting to 8.0 billion TL.

In addition to these measures, the **Agricultural Practices for Ecosystem-Based Adaptation (EbA) to Climate Change in Steppe Ecosystems (ETU) Project**, co-led by MoAF and FAO, is a key initiative designed to bolster resilience in steppe ecosystems by incorporating ecosystem-based adaptation strategies. This is complemented by the **Türkiye Climate Smart and Competitive Agricultural Growth Project (TUCSAP)**, which focuses on improving land management through detailed land-use plans. Meanwhile, the **Ocean Cleaning of Abandoned Fishing Gear Project** and the **Protection and Development of Fisheries Resources with Artificial Reefs** represent significant efforts to protect marine biodiversity and promote sustainable fisheries management. These projects are critical for maintaining the sustainability of Türkiye's agricultural and marine sectors in the face of increasing climate risks.

6.3.1.4 Disaster Risk Management

Türkiye has developed a comprehensive disaster risk management system, focusing on pre-disaster risk reduction, preparedness, and response. This system aligns with international frameworks, such as the **Sendai Framework for Disaster Risk Reduction**, and emphasizes coordinated efforts between national and local institutions. The key priorities identified for disaster risk management revolve around enhancing resilience, minimizing vulnerabilities to climate-induced disasters, and improving response mechanisms. Türkiye's disaster risk management efforts are supported by key institutions such as the **Disaster and Emergency Management Presidency (AFAD), the Turkish State Meteorological**

Service (TSMS), the General Directorate of State Hydraulic Works (DSI), and **the Directorate General of Water Management (DGWM).**

AFAD has been instrumental in transitioning Türkiye's disaster management approach from crisis management to disaster risk governance. Through national frameworks such as the **Türkiye Disaster Risk Reduction Plan (TARAP), the Türkiye Disaster Response Plan (TAMP),** and ongoing work on the **Post-Disaster Recovery Plan (TASİP),** Türkiye aims to clearly outline responsibilities and integrate disaster risk reduction into national development. These national plans are complemented by **Provincial Disaster Risk Reduction Plans (IRAP),** which provide specific risk reduction strategies tailored to local vulnerabilities.

Türkiye's approach emphasizes integrated disaster management, focusing on **pre-disaster risk reduction**, including policies that strengthen institutional capacities and allocate clear responsibilities across sectors. The **use of technology** is critical in this approach, with AFAD's **Disaster Risk Reduction System (ARAS)** supporting disaster risk mapping, analyzing hazards, and conducting risk assessments for various disaster types (e.g., landslides, avalanches, and floods). These technologies facilitate coordinated efforts across institutions. **Real-time early warning systems**, such as the **Flash Flood Guidance System (FFGS)**, provide high-accuracy warnings, ensuring timely interventions.

In Türkiye, the frequency and severity of floods have increased significantly due to climate change, particularly as a result of intensified rainfall events. Regions that were previously unaffected by floods are now experiencing them. Uncontrolled urbanization and unplanned interventions in stream beds have exacerbated this problem, especially in flood-prone areas. The DSI plays a pivotal role in managing flood and sediment control, following a comprehensive three-stage process: pre-flood, during flood, and post-flood activities.

In the **pre-flood stage**, DSI focuses on both structural and non-structural measures to mitigate flood risks. Structural measures include riverbed corrections, flood walls, embankments, and diversion channels, which aim to redirect rainfall from flood-prone areas. Sediment retention dams and improvement terraces are constructed in upstream areas to manage sediment and prevent erosion. Extensive machine operations are undertaken to maintain riverbeds and ensure the functionality of flood control infrastructure.

Non-structural activities include hydrometric and meteorological monitoring, flood-prone zone designations under **Law No. 4373**, and flood risk management training seminars. **Law No. 7269** also provides for the identification of high-risk

areas that may require resettlement. Additionally, **Türkiye's Flood Early Warning Systems Project** and the establishment of **Level Observation Stations (LOS)** across the country enable timely warnings to reduce the impact of potential floods.

DSI is responsible for clearing debris from natural and improved riverbeds **during flood events**, thereby preventing blockages and reducing the spread of flooding. Regional DSI personnel work closely with local authorities, coordinating urgent responses. DSI's Flood Management Center monitors real-time flood conditions using observation systems like LOS, ensuring immediate action.

After a flood event, DSI assesses the damage and undertakes recovery operations, which include repairing flood control structures and conducting large-scale debris removal to restore the functionality of river systems. Through the **Flood Intervention Information System (TAMBIS)**, DSI collects and analyzes data on past floods, improving future responses and enhancing decision-making.

Looking ahead, DSI plans to construct 314 additional flood control facilities by 2024 and a total of 903 facilities by 2028. These infrastructure expansions, alongside real-time flood monitoring and active intervention, aim to mitigate the growing risks of flooding across Türkiye. The **Flood Forecast and Early Warning System (TATUS)** is another critical tool in Türkiye's flood risk management strategy. It provides real-time data on potential flood events and aims to expand nationwide **by 2028**, ensuring a proactive response to flood risks. With rising temperatures and decreasing humidity levels, forest fires are also becoming a significant threat.

TSMS has developed the **Forest Fires and Meteorology Early Warning System (MEUS)**, which provides advance notice of high-risk conditions, allowing for timely interventions to protect ecosystems and communities.

The increased frequency of droughts and heatwaves due to climate change has also heightened the risk of landslides and avalanches. These events weaken vegetation and increase instability on slopes. To address these risks, Türkiye has initiated the **Identification of Potential Avalanche Release Zones Project**, which helps to mitigate damage by mapping vulnerable areas and taking preventive measures.

6.3.1.5 Biodiversity and Ecosystem Services

Climate change adaptation studies in the biodiversity and ecosystem services sector are conducted by various institutions, including the **MoEUCC**, the **Ministry of Agriculture and Forestry**, the **General Directorate of Nature Conservation and**

National Parks (GDNCNP), **General Directorate of Fisheries and Aquaculture**, and the **General Directorate of Combating Desertification and Erosion (ÇEM)**, along with agencies such as **DGWM** and **TAGEM**.

The "**National Biological Diversity Strategy and Action Plan (NBSAP)**" was developed by Türkiye following its participation in the United Nations Convention on Biological Diversity in 1996, and it was prepared as part of Türkiye's responsibilities under the 6th Article of the Convention. The NBSAP was updated in 2008 to cover the period from 2008-2017, and it included six thematic working areas related to different types of ecosystems: agricultural biological diversity, forest biological diversity, steppe biological diversity, mountain biological diversity, inland waters biological diversity, and shore-sea biological diversity. This update to the NBSAP was made accordance with the regulations of European Union in the scope of nature protection sector. Climate change is recognized as a strategic issue in the NBSAP, and it is specified that the impacts on biological diversity will be considered when determining and monitoring the impacts of climate change. The NBSAP has been updated again in 2018 to align with the Aichi Targets and recent action plans based on the country's national policies. As part of Türkiye's efforts to minimize the impacts of climate change on biodiversity, Türkiye has taken a position in support of nature-based solutions and an ecosystem-based approach in the Post-2020 Global Biodiversity Framework negotiations Türkiye will update its NBSAP according to the Kunming-Montreal Global Biodiversity Framework. In order to ensure the effective management and proper implementation of biological diversity in accordance with the Convention on Biological Diversity, also National Biodiversity Coordination Council has been established. To protect Türkiye's ecosystems, natural resources, and biological diversity, the MoEUCC and the MoAF have collaborated on a number of projects, including research on protected areas and projects related to the conservation and sustainable management of various types of ecosystems.

In addition to the efforts described above, Türkiye has also carried out various other projects to protect its biodiversity and ecosystem services. These include the Pilot Study on Valuation of Sultansazligi National Park, the National Biodiversity Inventory and Monitoring Project, the Project of Recording Traditional Knowledge Associated with Biological Diversity, Combatting Biopiracy Project and the Technical Assistance for Strengthening the National Nature Protection System for Implementation of Natura 2000 Requirements. In addition, the Project on Preparation, Implementation and Monitoring of Species Action Plans for Endangered Species in Türkiye within the Concept of a New Methodology is still

ongoing. Türkiye has also implemented projects to address the threat of invasive alien species, including the GEF VI Project on Addressing Invasive Alien Species Threats at Key Marine Biodiversity Areas and the Conservation, Sustainable Management of Türkiye's Steppe Ecosystem Project and Addressing of Invasive Alien Species Threats in Terrestrial Areas and Inland Waters in Türkiye. Overall, these efforts are aimed at ensuring the sustainability of Türkiye's natural ecosystems and the ecosystem services they provide, and at mitigating the impacts of climate change on biodiversity.

Biodiversity conservation and ecosystem management are vital to Türkiye's adaptation strategy. Several projects support the protection and rehabilitation of natural ecosystems, which are crucial for building resilience to climate change impacts. For example, the **Afforestation and Carbon Sink Area Projects**, initiated by the **Ministry of Agriculture and Forestry**, focus on planting trees in degraded or abandoned lands with the aim of sequestering carbon, reducing soil erosion, and improving biodiversity. These efforts also focus on establishing carbon sink areas through afforestation, enhancing carbon sequestration to combat climate change, and supporting biodiversity while improving water management. Additionally, these projects offer co-benefits, such as enhancing water retention in landscapes, which is particularly critical in water-stressed areas.

The **GEF-Funded Project: Land Degradation Neutrality (LDN), Upper Sakarya Basin Project** by demonstrating the LDN approach in the **Upper Sakarya Basin** is another essential initiative. This project addresses the restoration of degraded land and promotes sustainable land management practices. Capacity building is a strong component of this project, with local stakeholders being trained to adopt best practices that enhance resilience to climate change impacts. Additionally, the **GEF-Funded Project on Land Degradation Neutrality (LDN)** seeks to develop a decision support system for facilitate LDN target setting and sustainable land management, with a focus on mitigating the impacts of land degradation and climate change. This project emphasizes integrated planning, particularly in the Upper Sakarya Basin, to implement sustainable land management practices. Capacity building for local stakeholders is a key component, ensuring the adoption of best practices that enhance ecosystem and agricultural resilience.

Türkiye is committed to combating land degradation and desertification through its **National Strategy and Action Plan to Combat Desertification (2024-2030)**. This plan focuses on rehabilitating degraded land, protecting carbon sinks, and promoting nature-based solutions like afforestation and reforestation. The

General Directorate of Combating Desertification and Erosion plays a central role in these efforts, contributing to both climate adaptation and mitigation by restoring ecosystem services and enhancing the resilience of rural areas to climate impacts. Priorities include achieving land degradation neutrality targets, restoring degraded agricultural, pasture, and forest lands, and enhancing the resilience of both urban and rural areas to climate change. National coordination is key to effectively combating desertification. The **Türkiye Desertification Model and Susceptibility Map** further enhances efforts by monitoring the impacts of desertification and climate change on biodiversity and ecosystem services. It also focuses on developing a desertification model designed to mitigate and adapt to the risks posed by climate change, ensuring a proactive approach to land management and environmental protection.

In addition, Türkiye has implemented a number of measures to manage and protect its lakes and wetlands, including the **Wetland Management Plans Preparation Project** and the **Lakes and Wetlands Action Plan** (2017-2023), coordinated by the **DGWM**. These plans aim to preserve wetlands through integrated management and protect the balance between their ecological and economic uses. Projects like the **Pilot Study on Valuation of Sultansazligi National Park** and the **National Biodiversity Inventory and Monitoring Project** also contribute to these efforts.

In addition to its efforts, Türkiye has implemented the **National Land Cover Classification and Monitoring System (UASIS)**, which supports climate change scenarios, disaster models, and natural resource management by monitoring land cover changes. UASIS leverages artificial intelligence and machine learning for efficient land cover classification.

Furthermore, the General Directorate of Fisheries and Aquaculture has initiated the **Supporting Pufferfish Fishing Project** to control the invasive pufferfish population. This project enhances the sustainability of marine ecosystems by reducing the negative impacts of invasive species, such as pufferfish, which are exacerbated by climate change and threaten marine biodiversity and fisheries.

The **General Directorate of Nature Conservation and National Parks** has made significant progress in managing Invasive Alien Species (IAS) through the development of a robust policy framework aligned with international standards, particularly the EU Regulation 1143/2014. The Republic of Türkiye has focused on enhancing legal structures, establishing inter-sectorial advisory boards, and creating comprehensive strategies, action plans, and management plans to address IAS threats. Efforts include strengthening the capacity of governmental

departments, raising public awareness, and implementing targeted actions in both terrestrial and marine environments. The continued focus is on prevention, control, and eradication of IAS, with an emphasis on sustaining and protecting Türkiye's diverse ecosystems. As part of these efforts, pilot region implementations are being carried out in the Republic of Türkiye, involving different ecosystem models.

The GEF-funded project: "Addressing Invasive Alien Species Threats at Key Marine Biodiversity Areas Project" focuses on preventing, detecting, and managing invasive species to protect Turkey's coastal and marine ecosystems. This project's key components include developing national Invasive Alien Species policies, building capacity for IAS management, and investing in sustainable restoration of degraded marine habitats.

Moreover, **the General Directorate of Combating Desertification and Erosion** leads the implementation of various erosion control, afforestation, and disaster prevention projects aimed at minimizing soil losses and preventing natural imbalances caused by disasters like floods, avalanches, and landslides.

Between 2023 and 2024, 38 projects are being carried out, including:

- 5 flood and erosion control projects,
- flood control projects,
- 1 flood control implementation project,
- 2 afforestation and erosion control projects,
- avalanche hazard assessment projects,
- 2 avalanche control projects,
- 3 landslide and rockfall projects,
- 5 carbon sink area afforestation implementation projects,
- build carbon sink area projects

6.3.1.6 Coastal Areas

The coastal areas of Türkiye are home to diverse ecosystems, including beaches, salt marshes, rocky cliffs, and mangrove forests, offering ecological, economic, and social benefits. These areas provide habitats for various species, protect against natural disasters, and support recreational activities. However, they are vulnerable to climate change and human activities like urbanization, tourism, and pollution. To address these risks, Türkiye has focused on several adaptation strategies, as mentioned in the 8th National Communication, including the establishment of **Marine Protected Areas (MPAs)**, the implementation of

Integrated Coastal Zone Plans, and various conservation projects aimed at protecting marine biodiversity and coastal habitats.

Key adaptation efforts include the **Determination and Classification of Sea and Coastal Waters Project (2011-2014)** and the **Management of Urban Sewage on the Coasts of Türkiye Project**. **Integrated Coastal Zone Plans** have been completed for approximately 93% of the country's coastal zones by 2022, led by the **Ministry of Environment, Urbanization, and Climate Change (MoEUCC)**. These plans emphasize the sustainable management of coastal areas, aiming to balance economic development with ecological preservation. A six-year monitoring plan has also been initiated to observe coastal areas impacted by man-made structures and assess their environmental consequences.

Moreover, Türkiye aligns with international agreements, such as the **Barcelona Convention**, the **Paris Agreement**, and the **Sustainable Development Goals (SDGs)**, to promote an ecosystem-based approach to coastal adaptation. Dynamic **Marine Spatial Planning (MSP)** tools and **Area-Based Management Tools (ABMTs)** are considered essential for protecting migratory marine species and adapting to the shifting boundaries of marine habitats caused by climate change. These strategies contribute to building resilience in Türkiye's coastal regions and ensuring the protection of critical ecosystems under changing climate conditions.

6.3.1.7 Urban Areas

Urban areas in Türkiye are highly vulnerable to climate change due to dense populations and complex infrastructures. To address these challenges, Türkiye has introduced various strategies, such as the **New Urban Agenda**, focusing on building resilience, reducing greenhouse gas emissions, and promoting global and local climate action, particularly through ecosystem-based adaptation. The agenda supports long-term adaptation planning and encourages city-level vulnerability assessments.

The MoEUCC, alongside UNDP Türkiye, has implemented several projects aimed at enhancing urban resilience. Projects like the **Support Common Work in the Field of Climate Change** and the **Take Urgent Action to Combat Climate Change and Its Impacts** have involved climate awareness-raising activities and collaboration with local administations to create climate-resilient urban action plans. Another significant initiative, the **Enhance Adaptation Actions in Türkiye Project**, aims to improve urban climate resilience by developing city-level adaptation solutions.

To further advance urban climate strategies, the **National Spatial Strategy Plan 2053 (draft)** is currently being updated, focusing on region-specific development and urban planning strategies. TUBITAK MAM has also played a pivotal role in supporting urban adaptation through climate action plans for provinces like Tekirdağ, Çanakkale, Yalova, and Mersin. These projects, such as the **Preparation of Climate Change Action Plans** and the **Sustainable Energy and Climate Action Plan of Mersin Project**, focus on improving local administrations' capacity to adapt and mitigate climate impacts, while aligning with international agreements like the Global Covenant of Mayors.

6.3.1.8 Tourism and Cultural Heritage

Tourism, particularly in coastal areas, is highly vulnerable to the impacts of climate change, including rising sea levels and extreme weather events. To address these risks, the Ministry of Culture and Tourism (KTB) has implemented adaptation strategies focusing on protecting tourism infrastructure and integrating climate resilience into the planning and development of tourism sites.

One key initiative is the **Tourism Climate Index (TCI) Analysis and Climate Suitability Assessment in Çanakkale, Mersin, and Kayseri Provinces**. This project, **completed in July 2024,** assessed the seasonal temperature and precipitation conditions, as well as climate hazards such as heatwaves, heavy precipitation, forest fires, and extreme winds in the selected provinces. By analyzing the TCI with current and future climate data, the project identified how future climate change may impact tourism activities. The project also aimed to guide spatial tourism development based on climate conditions, providing recommendations on enhancing tourism potential and resilience in these provinces. This initiative aligns with the objectives set out in the **Climate Change Mitigation and Adaptation Strategy and Action Plans (2024-2030)**.

In addition, the **Climate Vulnerability and Risk Assessment and Adaptation Plans for Çanakkale, Mersin, and Kayseri** is another significant project under the Directorate of General Investments and Establishments. Scheduled for **completion in December 2024**, this project focuses on conducting comprehensive climate risk assessments for the tourism sector in these provinces. The project aims to develop adaptation strategies to mitigate the identified risks, ensuring the long-term sustainability and resilience of tourism in these regions. The adaptation plans will provide a framework for future tourism development, with a focus on investment recommendations that can improve tourism infrastructure and climate resilience.

In this context, these projects aim to provide a scientifically grounded guide for tourism sector stakeholders to understand the impacts of climate change on tourism and to develop adaptation strategies for these changes. Additionally, to adapt to climate change as a national policy, the project outputs will focus on promoting climate-friendly tourism policies as part of the action plan. The findings of the study serve as an essential guide for tourism planners, policymakers, and industry representatives.

Moreover, the Project Coordination Office (KVMGM) has proposed a project titled **Transition towards a Greener, Digital, and More Resilient Cultural Heritage Sector** under IPA III. This initiative aims to integrate climate action with digital transformation in the cultural heritage sector, focusing on sustainable practices and environmental protection. It seeks to strengthen the sector's resilience to climate impacts while promoting green energy use and digital infrastructure development. This project is part of broader efforts to ensure the cultural heritage and tourism sectors adapt effectively to the evolving challenges posed by climate change. The proposal is currently under review.

6.3.1.9 Energy

The **Ministry of Energy and Natural Resources (MENR)** plays a central role in Türkiye's adaptation strategies in the energy sector, addressing the impacts of climate change on energy production and infrastructure. Carbon and water footprint calculations were conducted in 2023 for pilot plants identified within **EUAS**, and these calculations will be extended to all EUAS plants to implement necessary measures to reduce environmental impacts.

Hydropower is a critical component of Türkiye's renewable energy mix, but it is vulnerable to climate change impacts like reduced water availability due to changing precipitation patterns. To adapt, Türkiye has explored the establishment of **Pumped Storage Hydraulic Power Plants (PSHPP)**, as evidenced by the **Gökçekaya PSHPP project**, which is included in the 2020 investment program. This approach will help stabilize energy production in water-scarce regions and provide a more resilient energy storage solution.

In the area of **nuclear energy**, Türkiye is advancing its nuclear power program, as outlined in the 12th Development Plan. Nuclear technology is generally resilient to various climate variables such as heavy precipitation and extreme weather events. However, one key vulnerability is the temperature and availability of cooling water, especially for plants located by rivers and lakes. Nuclear plants in

Türkiye are strategically located near seas to ensure a reliable cooling water supply, as recommended by the **International Atomic Energy Agency (IAEA)**.

Hybrid energy plants combining hydroelectric, solar, and wind power are also part of Türkiye's strategy to enhance the sustainability and efficiency of its renewable energy sources. This integration helps balance fluctuations in energy production and improves the country's energy security while reducing carbon emissions.

Floating solar power plants (**FSP**) installed on reservoir surfaces are another innovative solution being explored in Türkiye. These systems improve energy efficiency, reduce evaporation in dams and lakes, and conserve water while contributing to renewable energy production. The **MENR** has identified floating solar power plants as a key strategy for mitigating climate impacts while optimizing land and water use for energy generation.

Finally, efforts are being made to meet the energy demands of agricultural areas, particularly those irrigated by pumping, through the use of renewable energy sources. Establishing renewable energy facilities within irrigation zones is expected to reduce energy costs for farmers, increase the efficiency of irrigation systems, and contribute to food security.

6.3.1.10 Industry

Türkiye has established national policies aimed at increasing the adaptation capacity of its industrial sector. To mitigate the adverse impacts of declining water resources on industrial production, implementing water-saving practices and utilizing advanced technologies for water efficiency and treated wastewater reuse are essential to adapting the industry to the challenges posed by climate change. The government actively supports these efforts through legal regulations and financial incentives.

To improve water-use efficiency in the industrial sector and disseminate best practices, the **Project on Industrial Water Use Efficiency based on NACE Codes** has been conducted by the **Directorate General of Water Management (DGWM), Ministry of Agriculture and Forestry (MoAF)**. This project identified high water consumption areas in various industries, classified by NACE codes. As a result, separate water efficiency guidance documents were developed for 152 NACE codes, outlining water-saving techniques specific to each industry. These guidance documents, published alongside the **Water Efficiency Strategy**

Document and Action Plan, have been shared with sector representatives, and studies on promoting the implementation of these guidelines are ongoing.

These efforts not only improve the resilience of the industrial sector but also contribute to long-term sustainability. It has been demonstrated that expanding water efficiency practices is the most effective way to adapt to the negative impacts of climate change on water resources. In response to the risk of decreasing water potential caused by climate change, optimizing water use, reducing water losses, employing efficient water-use techniques and technologies, recycling water within the usage cycle, utilizing alternative water sources, and incorporating water-focused production planning have all been recognized as best practices.

6.3.1.11 Transportation and Communication

The **Preparation of Climate Change Strategies for Gaziantep, Erzurum, Ordu-Giresun, and Muğla Milas-Bodrum Airports (2021-2023) Project**, supported by the General Directorate of State Airports Authority and TUBITAK MAM, identifies climate change impacts on these airports and proposes adaptation and mitigation measures through cost-benefit analysis, creating strategy documents to guide future actions.

6.3.2 Adaptation Challenges and Gaps

Despite significant efforts to address climate change, Türkiye faces several barriers that hinder the realization of its adaptation strategies. Common challenges include a lack of communication between institutions, data limitations, technical and financial constraints, and policy and governance gaps.

6.3.2.1 Lack of Communication Between Institutions

One of the most significant barriers is the lack of communication between institutions. Coordination between national and local administrations and across various sectors is often weak, which hampers the effective implementation of adaptation measures. This communication gap leads to misunderstandings, duplication of efforts, and gaps in adaptation initiatives. Local administrations, particularly smaller municipalities, frequently lack the technical capacity and financial resources to conduct vulnerability assessments or carry out adaptation actions. Without effective communication and support from national institutions, these challenges are exacerbated.

Key Challenges

- Weak communication and coordination among national and local administrations, and across various sectors and institutions, impede the effective implementation of adaptation measures.
- Absence of clear communication channels and collaborative frameworks results in fragmented strategies. Institutions often work in silos, reducing the overall effectiveness of climate adaptation initiatives.
- Insufficient coordination affects project implementation, leading to delays and inefficiencies.
- Limited dissemination of sustainable practices and adaptation measures due to poor communication between national bodies and local institutions.
- Uncoordinated governance structures and insufficient coordination at local levels impede the development and execution of local adaptation strategies and actions.

Impact on Sectors

- The lack of coordination affects projects related to drought management, flood forecasting, and irrigation modernization. Delays and inefficiencies can lead to inadequate preparedness for water-related climate impacts.
- Limited communication hampers the dissemination of sustainable practices, affecting programs aimed at promoting environmentally friendly agriculture and climate resilience.
- Poor communication hinders efforts to combat desertification and manage ecosystems effectively, leading to fragmented conservation initiatives.

6.3.2.2 Lack of Reliable and Consistent Data

Another major barrier is the lack of reliable and consistent sectoral and climate data, which complicates vulnerability assessments and decision-making processes. While efforts are underway to improve data availability, data-sharing challenges between institutions continue to impede progress. Consistent, up-to-date data is essential for planning effective adaptation measures.

Key Challenges

- **Scarcity of comprehensive and up-to-date climate and sectoral data** complicates vulnerability assessments and decision-making. Inconsistencies in data and model outputs hinder accurate forecasting

and planning. Projects are affected by missing or hard-to-obtain historical data.

- **Difficulties in data sharing between institutions** impede access to essential information and updates. Changes in data-sharing policies and standards across institutions create barriers to effective data utilization.

Impact on Sectors

- Data limitations affect the ability to develop effective drought and flood management plans. Inaccurate or missing data impede the assessment of climate change impacts, making it challenging to prepare for and mitigate water-related risks.
- Without reliable data, conducting climate change related assessments, such as vulnerability and risk assessments, and implementing appropriate adaptation strategies becomes difficult. This impacts the effectiveness of agricultural adaptation programs.
- The lack of consistent data on soil health, land degradation, and biodiversity hinders efforts to monitor ecosystems and implement conservation measures, affecting projects aimed at combating desertification and promoting land health.
- Projects focused on enhancing climate adaptation actions at the local level are hindered by a lack of reliable data, affecting the development and execution of tailored strategies.

6.3.2.3 Technical and Financial Constraints

Financial constraints represent another major challenge. While international donors and national and international funding programs provide financial support for adaptation projects, many initiatives, particularly at the local level, suffer from inadequate or intermittent funding. Long-term projects, such as afforestation efforts, require sustained investment to ensure their success, and local administrations often struggle to secure the necessary resources.

Key Challenges

- **Limited technical expertise and institutional capacity**: Many local administrations, especially smaller municipalities, lack the technical expertise and resources needed to conduct climate change related assessments or carry out adaptation actions effectively. This includes limited capacity for advanced modeling, cost-benefit analyses, and implementation of efficient adaptation measures.

- **Inadequate or intermittent funding**: Financial constraints affect the sustainability of adaptation projects. Long-term initiatives like afforestation, infrastructure modernization, and water efficiency measures require sustained investment, which is often lacking.

Impact on Sectors

- Financial and technical constraints hinder efforts to modernize irrigation systems and implement water efficiency measures. Projects face challenges due to substantial water losses and limited capacities.
- Funding limitations affect programs promoting sustainable agriculture and climate adaptation. Technical constraints hinder the implementation of environmentally friendly practices, affecting the sector's resilience.
- Limited capacities and financial constraints affect the development and execution of local adaptation strategies, impeding efforts to build climate resilience at the community level.

6.3.2.4 Policy and Governance Gaps

Policy and governance gaps present significant obstacles to effective climate adaptation in Türkiye. The lack of cohesive policies and legal frameworks undermines the implementation of national adaptation strategies and action plans.

Key Challenges

- **Absence of a comprehensive legal infrastructure**: The lack of cohesive policies and clear legal frameworks impedes the formulation and enforcement of regulations necessary for successful adaptation. This affects the ability to implement national adaptation strategies across various sectors.
- **Fragmented governance structures and unclear responsibilities among institutions**: This leads to inconsistent application of policies and hampers cohesive action on adaptation initiatives. Overlapping mandates and lack of clear leadership result in inefficiencies and delayed implementation.

Impact on Sectors

- Policy gaps affect the ability to enforce regulations necessary for sustainable management. National adaptation strategies are hindered by the absence of comprehensive legal infrastructure and coordination gaps.

- Governance gaps can lead to inconsistent application of sustainable practices across regions, affecting resilience to climate change. Lack of clear policies may impede the implementation of adaptation measures.
- Challenges in achieving land degradation neutrality arise due to insufficient policy support. Projects are constrained by an inadequate enabling environment from policy, planning, and capacity perspectives.

6.3.3 Adaptation Strategies, Policies, Plans, Goals, and Actions

Türkiye has been actively implementing adaptation actions in accordance with its international commitments and the global goal on adaptation as set out in Article 7, paragraph 1, of the Paris Agreement. These efforts aim to enhance adaptive capacity, strengthen resilience, and reduce vulnerability to climate change across various sectors. The implementation spans various sectors and other critical areas, involving multiple institutions and comprehensive strategies.

6.3.3.1 Implementation of Adaptation Actions

Türkiye has implemented several key adaptation actions:

- **Drought Management**: Türkiye developed drought management plans for 25 river basins to minimize the negative impacts of drought risks. These plans focus on efficient water use in irrigation, reducing losses in drinking water networks, and protecting wetlands. By promoting water conservation and sustainable practices, these initiatives enhance the resilience of water resources to prolonged dry periods.
- **Flood Preparedness and Risk Management**: To tackle the increasing frequency of floods, flood forecasting and early warning systems have been established in several river basins. These systems use real-time data to generate hazard maps, allowing for timely warnings and effective response measures. Additionally, comprehensive flood management plans have been developed to assess flood risks and propose preventive measures, facilitating informed decision-making and infrastructure planning.
- **Enhancing Water Efficiency and Reuse under the Adaptation to Climate Change in Water Resources Project:**
    - **Rainwater Harvesting and Greywater Reuse**: Analyzed rainwater harvesting systems in seven different building types across 42 micro areas and greywater use systems in five building types across 30 micro areas in six provinces. Implemented 10 pilot projects—five for rainwater harvesting and five for greywater reuse—to promote the

adaptation of water resources, reducing reliance on freshwater sources and enhancing water efficiency in urban areas.

- **Guidance Documents and Best Practices**: Prepared 162 guidance documents containing technical procedures and principles regarding the best available techniques for water efficiency in industrial sectors, practices for managing water losses in drinking water systems, good management practices to increase water efficiency in agricultural irrigation, and the use of alternative water resources such as rainwater harvesting, greywater use, and reuse of treated water.
- **Draft Water Efficiency Regulation**: Prepared a draft regulation to ensure urban, industrial, agricultural, and individual water efficiency. The regulation aims to establish water efficiency systems, prepare plans, and certify good practices, providing a legal framework to enhance water conservation efforts.

- **Assessing Climate Change Impacts on Water Resources**
  - **Climate Change Impact on Water Resources Project**: Improved a methodology for analyzing the effects of climate change on main sectors such as drinking water, agriculture, industry, ecosystems, tourism, and energy. Evaluated the impact of water on these sectors considering climate projections in three basins. Systematic evaluation of data from projection studies (2015-2100) determined vulnerability levels under categories of slight, medium, high, and extremely high impact. Analyzed adaptation strategies and activities implemented globally, suggesting 138 sector-specific adaptation activities.
  - **Assessment of Climate Change Impacts on Snowmelt and Streamflow**: Conducted studies to evaluate the impacts of climate change on snowmelt and streamflow, providing critical insights into future water availability. These assessments inform adaptation strategies for water resource management and help plan for climate-induced variability.
- **Modernizing Irrigation Systems**:
  - **Project to Enhance Water Circularity and Efficiency**: Addresses adaptation in water-stressed areas by promoting wastewater reuse, modernizing irrigation systems, and improving overall water

efficiency. Introduces advanced irrigation technologies and encourages the reuse of treated wastewater to reduce water scarcity and enhance agricultural productivity sustainably.

  - **Türkiye Irrigation Modernization Project**: Focuses on upgrading irrigation systems to increase water use efficiency. The introduction of pressurized irrigation systems reduces water losses, ensuring effective utilization of water resources. This modernization enhances agricultural resilience to climate variability and supports sustainable practices.

- **National Water Efficiency Strategy**: A Water Efficiency Strategy Document has been published to guide national efforts from 2023 to 2033. This strategic document provides a roadmap for enhancing water conservation and resilience nationwide, outlining goals and actions to improve water use efficiency across sectors.
- **Promoting Sustainable Agricultural Practices**: Programs encourage the implementation of environmentally friendly farming techniques, including soil erosion control and biodiversity enhancement. By adopting these practices, the agricultural sector reduces its vulnerability to climate change and supports food security.
- **Enhancing Climate Resilience in Agriculture**: Adaptation measures include integrating climate considerations into agricultural planning, enhancing the capacity of farmers to adapt to changing climatic conditions, and promoting the use of climate-resilient crop varieties. These actions strengthen the resilience of the agricultural sector to climate variability.
- **Combating Desertification and Land Degradation**:
  - **National Strategy and Action Plan to Combat Desertification (2024-2030)**: Implements nature-based adaptation measures, including the restoration and rehabilitation of degraded agricultural, pasture, and forest lands. Aims to increase the resilience of urban and rural areas to climate change and ensure the sustainable use of water resources.
  - **Türkiye Desertification Model and Susceptibility Map**: Creates comprehensive models to monitor desertification trends and identify areas sensitive to desertification. This information guides decision-making and adaptation measures to prevent further land degradation.

- **Land Degradation Neutrality-Decision Support System (LDN-DSS)** is computer-based system that allow decision-makers to make correct and effective decisions with integrated data and models. While designing the LDN-DSS indicators (Land Cover, Land Productivity Dynamics, Soil Organic Carbon (SOC)) were taken as a basis. In addition, the system is supported by other existing indicators that serve to monitor LDN.

- **Soil Conservation and Carbon Sequestration**:
  - **Soil Organic Carbon Project (TOK)**: Established a national digital soil organic carbon monitoring system and mapped soil organic carbon distribution. Periodic revisions maintain the system's relevance. Understanding and monitoring soil organic carbon enhances soil health and informs land management practices contributing to carbon sequestration.
- **Protecting Biodiversity and Managing Invasive Species**:
  - **Supporting Pufferfish Fishing Program**: Reduces the population of invasive pufferfish by providing support to fishermen. This initiative contributes to the protection of aquatic biodiversity and enhances the sustainability of aquatic ecosystems.
- **Sustainable Land and Forest Management**:
  - **Contributing to Land Degradation Neutrality (LDN)**: Implements sustainable land management (SLM) and sustainable forest management (SFM) practices. Demonstrates best practices in forestry and agriculture for climate adaptation. Establishes a decision support system to aid in land use planning and adaptation efforts.
- **Afforestation and Creating Carbon Sinks**:
  - **Creating Carbon Sink Areas Project**: Initiated afforestation efforts to enhance carbon sequestration. Contributes to adaptation through improved water management, soil retention, and disaster risk reduction. Ongoing monitoring ensures the effectiveness of these efforts over time.
- **Land Cover Classification and Monitoring**:
  - **National Land Cover Classification and Monitoring System (UASIS)**: Developed to produce land cover maps using artificial intelligence.

Helps assess changes in land use and land degradation, crucial for monitoring environmental changes and planning appropriate adaptation actions.

- **Climate Change Adaptation Strategy and Action Plan (2024-2030)**:
    - This comprehensive plan focuses on enhancing resilience across multiple sectors, including agriculture, water resources, biodiversity, tourism, and energy. Emphasizes vulnerability and risk assessments, public awareness, institutional capacity building, and cross-sectoral collaboration to ensure a cohesive national approach to climate adaptation.
- **Regional and Local Climate Action Plans**:
    - **Regional Climate Change Action Plans**: Prepared for all seven geographical regions to identify regional action needs and solutions, aligning with the 11th Development Plan (2019-2023) to increase urban resilience to climate change.
    - **Local Climate Change Action Plans**: Target set to prepare plans in 30 metropolitan municipalities by 2023. Efforts include developing legal and technical infrastructure, building stakeholder capacity, and supporting local administrations through various projects.
- **Strengthening Local Adaptation Capacities**:
    - **Enhancing Climate Adaptation Action in Türkiye Project**: Developed Local Climate Change Adaptation Strategy and Action Plans for four pilot cities. Provides financial support to municipalities and creates a Climate Portal for monitoring and evaluating adaptation initiatives. Enhances local capacities to implement measures effectively.
    - **EU Partnership for Local Climate Action in Türkiye**: Develops Local Climate Change Action Plans for six pilot cities. Conducts vulnerability assessments and implements training programs to enhance local capacity for adaptation, ensuring communities are equipped to respond to climate challenges.

6.3.4 Adaptation Goals and Objectives

Türkiye has established comprehensive adaptation goals and objectives to enhance resilience and reduce vulnerability to climate change across all sectors. These goals provide a strategic framework guiding the nation's efforts to address

the specific challenges posed by climate change, ensuring sustainable development and the protection of natural resources. **By aiming to ensure sustainable management and enhance resilience to climate-related challenges across all sectors, Türkiye's primary goals include:**

- **Enhancing Water Security:** Türkiye seeks to secure a reliable water supply for all sectors by improving water resource management under changing climate conditions. This involves safeguarding water availability for domestic use, agriculture, industry, and ecosystems.
- **Reducing Vulnerability to Droughts and Floods:** Strengthening preparedness and response mechanisms is crucial to minimize the impacts of extreme weather events. Objectives include improving drought management efficiency, implementing early warning systems for floods, and enhancing community readiness to reduce potential damages.
- **Improving Water Use Efficiency:** Promoting efficient water use across agricultural, industrial, and domestic sectors is a key objective. This involves reducing water losses, optimizing irrigation practices, and encouraging the adoption of water-saving technologies to conserve resources.
- **Promoting Alternative Water Resources:** Türkiye aims to diversify its water sources by adopting non-conventional methods such as rainwater harvesting and greywater reuse. By reducing reliance on traditional freshwater sources, the country enhances its resilience to water scarcity.
- **Strengthening Legal and Institutional Frameworks:** Establishing robust policies and regulations supports effective water resource management. Enhancing legal and institutional capacities ensures the implementation of adaptation measures and enforcement of water conservation efforts.
- **Enhancing Resilience of Agricultural Systems:** Türkiye aims to adapt farming practices to withstand climate change impacts, ensuring sustainable agricultural production. This includes adopting climate-smart agriculture techniques that improve productivity and resilience.
- **Promoting Sustainable Farming Practices:** Encouraging environmentally friendly agricultural methods conserves soil and water resources, enhances biodiversity, and reduces greenhouse gas emissions. Sustainable practices mitigate climate risks and support long-term viability.
- **Developing Climate-Resilient Crop Varieties:** Prioritizing research and development of crop varieties tolerant to climatic stresses like drought, heat, and pests helps maintain yields under adverse conditions. Introducing resilient crops supports farmers' livelihoods.

- **Enhancing Farmers' Adaptive Capacity:** Empowering farmers through training and access to resources is crucial. Objectives include providing education on adaptive practices, supporting new technologies, and facilitating knowledge exchange among farming communities.
- **Improving Water Management in Agriculture:** Efficient use of water is vital. Türkiye aims to optimize irrigation methods, reduce water wastage, and implement water-saving technologies to address water scarcity challenges in agriculture.
- **Supporting Rural Development:** Strengthening the economic resilience of rural communities involves promoting income diversification, improving market access, and enhancing infrastructure to support sustainable agricultural development.
- **Protecting and Restoring Ecosystems:** Conserving biodiversity by protecting existing natural habitats and restoring degraded ecosystems is a primary goal. Healthy ecosystems are more resilient to climate impacts and provide essential services.
- **Combating Land Degradation and Desertification:** Addressing land degradation involves implementing measures to prevent soil erosion, maintain soil fertility, and rehabilitate degraded lands. Sustaining ecosystem productivity is vital for adaptation.
- **Increasing Carbon Sequestration:** Enhancing carbon sinks through afforestation and reforestation efforts contributes to climate mitigation and strengthens ecosystem resilience. Increasing forest cover is a key objective.
- **Managing and Controlling Invasive Species:** Reducing the impact of invasive species on native ecosystems helps preserve biodiversity and maintain ecological balance. Effective management protects ecosystem functions.
- **Integrating Climate Adaptation into Land Use Planning:** Incorporating adaptation considerations into land use policies ensures sustainable management of natural resources. This includes protecting vulnerable ecosystems through appropriate zoning and regulations.
- **Enhancing Monitoring and Data Collection:** Improving environmental data collection and analysis supports informed decision-making. Establishing robust monitoring systems allows Türkiye to track ecosystem changes and assess adaptation measures' effectiveness.

Beyond sector-specific goals, Türkiye has broader objectives to strengthen national adaptation efforts:

- **Developing a Comprehensive National Adaptation Framework:** Establishing a unified strategy guides adaptation efforts across all sectors and government levels. This framework ensures coordinated action and efficient resource allocation.
- **Strengthening Local Adaptation Capacities:** Empowering local authorities and communities is essential for effective adaptation. Building institutional capacities, providing financial and technical support, and involving communities in planning enhance local resilience.
- **Increasing Public Awareness and Education:** Raising awareness about climate change impacts and adaptation strategies fosters a culture of resilience. Türkiye seeks to educate the public through campaigns, school programs, and stakeholder engagement.
- **Building Institutional and Technical Capacity:** Enhancing institutions' abilities to plan and execute adaptation measures includes training personnel, developing technical expertise, and improving inter-agency coordination.
- **Integrating Adaptation into Policies and Legislation:** Embedding climate adaptation considerations into national and local policies ensures sustained commitment. Updating laws and regulations supports adaptation initiatives and enforces compliance.
- **Promoting Cross-Sectoral Collaboration:** Fostering cooperation among different sectors and stakeholders leads to integrated adaptation solutions. Türkiye encourages partnerships and information sharing to address climate challenges collectively.
- **Enhancing Data Management and Sharing:** Developing robust data systems supports evidence-based decision-making. Improving data collection, management, and sharing among institutions facilitates transparency and informed policy development.

6.3.5 Science, Gender, and Knowledge Integration

Türkiye's climate change adaptation efforts are characterized by the integration of best available science, nature-based solutions, and stakeholder involvement across various sectors. While the inclusion of gender perspectives and traditional, and local knowledge varies among initiatives, several projects demonstrate a commitment to holistic and sustainable adaptation strategies.

In the water resources sector, scientific methodologies are pivotal in enhancing resilience to climate change. Advanced hydrological and meteorological modeling are employed to improve water scarcity management and flood

preparedness. Projects such as the Drought Management Plans and the Flood Forecasting and Early Warning System leverage real-time data and predictive analytics to inform decision-making, aligning with national and international best practices.

Stakeholder involvement is emphasized through public awareness campaigns and collaborations with local communities and government agencies. Training sessions and guidance documents are provided to local administrations to foster capacity-building. However, the explicit integration of gender perspectives and traditional, and local knowledge is less prominent in these initiatives.

In the agriculture sector, programs focus on agri-environmental practices, integrating best available science to enhance resilience. Sustainable farming practices are promoted, acknowledging and utilizing local farming knowledge that incorporates traditional insights. Nature-based solutions, such as soil conservation and biodiversity enhancement, are central to these initiatives, providing mitigation co-benefits through improved carbon sequestration and reduced erosion. While gender perspectives are not explicitly detailed, the involvement of farmers as key stakeholders is crucial for the success of these programs.

Efforts to combat land degradation and enhance ecosystem resilience incorporate scientific methods and nature-based solutions. Restoration activities, such as afforestation and soil conservation, serve as adaptation measures that utilize scientific approaches in soil protection and water resource management. Collaboration with various institutions promotes knowledge sharing and collective action.

Land Degradation Neutrality (LDN), Upper Sakarya Basin Project notably integrates gender perspectives and local knowledge. A Gender Action Plan was developed to enhance women's participation, and participatory planning involved local communities, integrating traditional knowledge into sustainable land management strategies. This project employs nature-based solutions like crop rotation and afforestation, with active involvement from farmers, including women, highlighting the importance of inclusive stakeholder engagement.

Other initiatives utilize advanced scientific techniques, such as the Analytical Hierarchy Process for desertification modeling and machine learning algorithms for soil organic carbon monitoring. Collaboration with universities, public institutions, and the private sector facilitates comprehensive knowledge

integration, though specific references to local knowledge and gender perspectives are limited.

Türkiye's broader adaptation efforts also reflect best available science and knowledge integration. The Climate Change Adaptation Strategy and Action Plan incorporates comprehensive climate risk assessments and vulnerability analyses across multiple sectors, emphasizing public awareness and participation. This strategy includes a focus on vulnerable groups and considers gender perspectives within the adaptation process. Although traditional, and local knowledge are not specifically highlighted, the promotion of nature-based solutions aligns with sustainable development objectives.

Projects like the Enhancing Climate Adaptation Action in Türkiye and the EU Partnership for Local Climate Action integrate advanced scientific tools, such as detailed vulnerability and risk assessments and climate portals for data collection. These initiatives consider gender perspectives by focusing on vulnerable groups, including women, in climate adaptation efforts. Stakeholder involvement is key, engaging local administrations, communities, and the private sector in planning and implementation.

6.4 PROGRESS ON IMPLEMENTATION OF ADAPTATION

6.4.1 Implementation Progress

Türkiye has made significant strides in implementing adaptation actions to address the impacts of climate change across various sectors. This progress reflects the country's commitment to enhancing resilience, reducing vulnerability, and aligning with national policies and international commitments under the Paris Agreement.

In the sectors, substantial progress has been achieved through the development and execution of strategies aimed at mitigating and adapting to climate change impacts:

- **Drought Management Plans**: Completed for all 25 river basins, these plans involve drought analyses, sectoral impact assessments, and the identification of basin-specific adaptation actions. Their implementation enhances water scarcity resilience and aligns with the National Drought Management Strategy.
- **Flood Forecasting and Early Warning System**: Established in 15 pilot sub-basins, this system provides real-time flood forecasting and early warnings,

improving disaster preparedness. Expansion to additional river basins is planned between 2024 and 2026, further strengthening flood risk management.

- **Flood Management Plans**: Implemented across 25 river basins, these plans include comprehensive flood hazard mapping and risk assessments. By focusing on both structural and non-structural measures, they improve institutional coordination and integrate flood risk considerations into regional planning.
- **Rainwater Harvesting and Greywater Reuse Projects**: 10 pilot projects have been successfully implemented in metropolitan areas, promoting the use of alternative water resources. Training and awareness campaigns have been conducted to encourage water conservation and efficient use.
- **Assessment of Climate Change Impacts**: Projects evaluating the impacts on snowmelt, streamflow, and overall water resources have been completed, providing valuable data for future water resource planning. These assessments inform adaptation strategies and enhance understanding of climate impacts on critical water sources.
- **Water Efficiency Strategy Document (2023–2033)**: The publication of this strategic document, along with an action plan and campaign, marks a significant step toward improving water efficiency across various sectors. It promotes water conservation and the utilization of alternative water resources.
- **Irrigation Modernization**: The Türkiye Irrigation Modernization Project has made substantial progress in modernizing irrigation systems, achieving a 46% completion rate. By improving irrigation services and promoting efficient water use, the project enhances agricultural resilience to climate variability.
- **IPARD II and IPARD III Programmes**: Implementation focuses on agri-environmental measures that support sustainable agricultural practices. By promoting environmentally friendly farming, soil conservation, and biodiversity enhancement, these programmes reduce agricultural vulnerabilities to climate change.
- **Desertification Model and Susceptibility Map**: Ongoing research and monitoring have facilitated the identification of areas at risk of

desertification. This supports adaptation planning by providing critical data for sustainable land management.

- **Supporting Pufferfish Fishing Initiative**: Implemented to control the population of invasive pufferfish species, this program protects aquatic biodiversity and contributes to sustainable fisheries management.
- **Land Degradation Neutrality (LDN), Upper Sakarya Basin Project**: Development of a Decision Support System and the implementation of best agricultural, forestry practices have advanced sustainable land management. Scaling up the LDN approach contributes to enhanced land management practices that mitigate climate change impacts.
- **Afforestation Efforts**: The Creating Carbon Sink Areas Project has established afforestation and carbon sink areas, enhancing carbon sequestration and supporting biodiversity. Continuous monitoring ensures the effectiveness of these efforts.
- **National Land Cover Classification and Monitoring System (UASIS)**: Implementation of this system provides essential data for climate scenario analysis and natural resource management, informing adaptation planning.
- **National Strategy and Action Plan to Combat Desertification (2019–2024)**: Continued implementation includes restoring degraded lands, increasing climate resilience, and integrating adaptation goals into land use planning.
- **Soil Organic Carbon Project (TOK)**: Completion of nationwide soil organic carbon mapping enhances understanding of soil carbon dynamics, supporting sustainable land management practices.
- **Tourism Climate Index (TCI) Analysis and Climate Suitability Assessment in the provinces of Çanakkale, Mersin, and Kayseri Project:** Enhancing the tourism sector's resilience by conducting TCI analyses and focusing on climate-friendly tourism policies in key provinces.
- **Enhancing Climate Adaptation Action in Türkiye Project**: This project emphasizes local climate adaptation, capacity building, and developing adaptation strategies for vulnerable sectors. Establishing a Climate Portal and creating local climate adaptation plans for pilot provinces strengthen resilience at the local level.

- **EU Partnership for Local Climate Action in Türkiye**: Initiated climate projection modelling studies for 3 km resolution, and vulnerability and risk assessments for local regions. Developing Local Climate Change Action Plans for six pilot cities supports local adaptation efforts with detailed climate projections and decision-support tools.
- **Climate Change Adaptation Strategy and Action Plan (2024–2030)**: Scheduled adaptation actions focus on nature-based solutions, flood control, and sustainable urban planning. Targeting sectors vulnerable to climate change with tailored strategies emphasizes sector-specific adaptation measures.

6.4.2 Coordination and Policy Changes

Türkiye has implemented various initiatives to enhance climate change adaptation through policy reforms and strengthened coordination across sectors. Key efforts include:

- **Strengthening Inter-Institutional Collaboration**: The Ministry of Agriculture and Forestry's Directorate General for Water Management has enhanced cooperation among various stakeholders to promote sustainable water use. Joint initiatives, such as the **Water Efficiency Strategy Document and Action Plan (2023–2033)**, address sectoral planning and aim to reduce water losses.
- **Legal and Institutional Capacity Building**: Drought Management Plans and enhanced coordination among agencies improve preparedness for droughts across 25 river basins.
- **Expansion of Flood Management Systems**: The **Flood Forecasting and Early Warning System** is set to expand to additional river basins by 2026, reflecting a commitment to enhancing nationwide flood risk management infrastructure. Regular coordination meetings facilitate updates to **Flood Management Plans**, integrating flood risk considerations into all planning activities.
- **Regulatory Advancements**: The **Adaptation to Climate Change in Water Resources Project** led to the preparation of a **Water Efficiency Regulation**, enhancing urban and industrial water efficiency. This regulatory commitment promotes sustainable water management practices at the municipal level.

- **Data Sharing and Climate Integration**: Projects assessing climate change impacts on snowmelt and streamflow have fostered data-sharing initiatives with multiple stakeholders. These efforts integrate climate projections into planning processes, demonstrating a shift toward proactive adaptation planning.
- **Modernizing Irrigation Practices**: Coordination between the General Directorate of State Hydraulic Works (DSİ), local irrigation associations, and financial institutions has facilitated the modernization of irrigation systems. Policy reforms emphasize efficient water management and the adoption of advanced irrigation technologies.
- **Multi-Stakeholder Collaboration**: The development of the **Türkiye Desertification Model and Susceptibility Map** involved over 25 stakeholders, enhancing desertification monitoring and control. Policy adaptations integrate new data-sharing policies and update systems according to evolving standards.
- **Land Degradation Neutrality (LDN), Upper Sakarya Basin** Project established intersectoral coordination across forestry and agriculture. Policy changes include developing decision-making tools for land use planning and integrating innovative approaches for climate adaptation.
- **Afforestation Initiatives**: The **Creating Carbon Sink Areas** project strengthened interinstitutional relations to implement carbon sequestration efforts. Policy updates support afforestation on state-owned lands, reflecting a strategic approach to climate mitigation.
- **Enhanced Land Management Policies**: Implementation of the **National Land Cover Classification and Monitoring System** involves coordination with numerous public institutions. Policy changes improve inter-institutional data-sharing and update land cover systems based on new standards.
- **Soil Conservation Efforts**: The **Soil Organic Carbon Project** facilitated coordination among stakeholders to harmonize soil data. Policy changes support a unified approach to soil management and the establishment of a national digital monitoring system.
- **Local Climate Adaptation Planning**: The **Enhancing Climate Adaptation Action in Türkiye Project** and the **EU Partnership for Local Climate Action** involve collaboration with local administrations and institutions. Policy

updates include developing local adaptation plans aligned with national objectives and incorporating climate projections into regional planning.

- **National Strategy Development**: The **Climate Change Adaptation Strategy and Action Plan (NASAP)** reflects extensive coordination with 180 institutions. Policy developments establish legal and institutional frameworks to support nationwide adaptation measures.

6.5 MONITORING AND EVALUATION OF ADAPTATION ACTIONS AND PROCESSES

6.5.1 Monitoring Systems in Place

Türkiye has established various monitoring systems to track and evaluate the implementation of adaptation actions across multiple sectors. These systems are essential for assessing progress, informing policy decisions, and ensuring the effectiveness of adaptation strategies.

- **Climate Portal:** Developed by the Directorate of Climate Change under the Enhancing Climate Adaptation Action in Türkiye Project, this platform monitors and evaluates national and local adaptation plans, facilitating data sharing and informed decision-making. Within this platform:
    - **National Adaptation Plan Monitoring:** Climate Portal tracks progress and reports outcomes related to the Climate Change Adaptation Strategy and Action Plan.
    - **Local Climate Change Action Plan Monitoring:** Climate Portal also tracks progress at the municipal level, enhancing transparency and supporting the effective implementation of adaptation measures.
- **Drought Management Monitoring**: Implementation of drought measures in all basins is monitored every six months to ensure the effectiveness of Drought Management Plans in reducing drought impacts.
- **Irrigation Projects Monitoring**: The General Directorate of State Hydraulic Works (DSİ) conducts regular monitoring through reports and performance indicators, including irrigation efficiency and water user data, for projects like the Project to Enhance Water Circularity and Efficiency and the Türkiye Irrigation Modernization Project.

6.6 COOPERATION, GOOD PRACTICES, EXPERIENCE, AND LESSONS LEARNED

6.6.1 Sharing Information and Best Practices

Through collaborative efforts, pilot projects, and policy innovations, the country fosters cooperation to strengthen science, institutions, and adaptation actions, enhancing the effectiveness of its adaptation measures.

In the water resources sector, projects like the Flood Forecasting and Early Warning System, Flood Management Plans, and the Adaptation to Climate Change in Water Resources Project promote knowledge sharing by developing and disseminating real-time data, risk assessments, and innovative practices such as rainwater harvesting and greywater reuse. These initiatives enhance planning and policy development while fostering institutional cooperation.

In agriculture, the IPARD II and III Programmes promote sustainable farming practices by sharing agro-environmental measures with farmers, integrating adaptation strategies into agricultural planning and enhancing resilience.

For ecosystems, initiatives such as the National Land Cover Classification and Monitoring System, the National Strategy and Action Plan to Combat Desertification, the Soil Organic Carbon Project, and the Land Degradation Neutrality (LDN), Upper Sakarya Basin Project facilitate the exchange of best practices in land management, desertification control, and soil conservation. Stakeholder collaboration and sharing of data and methodologies strengthen adaptation actions and policy integration.

The initiatives, including the Climate Change Adaptation Strategy and Action Plan and local climate action projects like the Enhancing Climate Adaptation Action in Türkiye and the EU Partnership for Local Climate Action, encourage information sharing and cooperation among municipalities, NGOs, and other stakeholders. These efforts support the development of local adaptation plans and strengthen climate resilience at national and local levels.

7 SUPPORT NEEDED AND RECEIVED

7.1 INSTITUTIONAL ARRANGEMENTS AND COUNTRY-DRIVEN STRATEGIES

7.1.1 INSTITUTIONAL ARRANGEMENTS

The main actors involved in institutional arrangements for climate finance and reporting are the Directorate of Climate Change (DoCC) under the Ministry of Environment, Urbanization, and Climate Change (MoEUCC), which manages climate change policies; the Climate Change and Adaptation Coordination Board (CCACB), which facilitates inter-ministerial and stakeholder coordination in developing national and international climate finance strategies; the Ministry of Treasury and Finance (MoTF), responsible for securing external funding; and the Presidency of Strategy and Budget Office (PSB), which manages the national budget and investment programs. Additionally, the line ministries and other relevant public agencies that implement sectoral investments and monitor needs in their domains have important roles under the institutional arrangements. Establishing the DoCC to coordinate and support Türkiye's climate efforts is one of the important milestones in enhancing the country's institutional capacity.

High-level discussions and decisions within the CCACB, address the country's reporting obligations, including climate finance. There are eight working groups operating under the CCACB, two are dedicated to handling climate finance and reporting issues: one for Climate Finance and the other for Climate Negotiations and International Reporting. These working groups, coordinated by the DoCC, hold meetings with the relevant stakeholders to address these issues.

As another key institution, the PSB is charged with preparing the development plan, MTP, medium-term financial plan, and the annual program. It also develops sectoral and thematic policies and strategies, allocates public resources, prepares and implements the central government budget, and handles the coordination, monitoring, evaluation, and reporting of all related activities, including plans, programs, resource allocation, budget, policies, and strategies. PSB also oversees the development of national policies related to climate change and ensures their alignment with annual plans and investments program. Monitoring Development Plans is essential for assessing the achievement of Türkiye's climate policies. Quarterly updates on the implementation of planned activities are shown in the Presidential Plan Program Monitoring and Evaluation System and thus the Presidency monitors the results via this system.

The MoTF is responsible for managing revenue, cash, debt, accounting, and internal control functions. It manages the country's relations with external creditors. The preparatory and procurement phases of investment projects, including technical and economic feasibility studies, as well as social and environmental assessments, are carried out by the respective line ministries and public agencies. The MoTF's main role is to secure and finalise the project implementing institution's request for external financing with the creditor institutions. Throughout this process, the implementing institutions consult with both the MoTF and the PSB for the design and smooth implementation of the project. Additionally, MoTF oversees the follow-up and accounting processes for funds related to climate finance.

The MoTF also has a task for building an enabling environment for green finance and investments and for this purpose it has formulated various strategy documents and guidelines to promote climate finance inflows to the country. As part of this effort, the Ministry issued the Sustainable Finance Framework205 in November 2021 to support the issuance of green, social, and sustainable bonds in the international capital markets. The Framework aims to enable the financing of eligible public green projects in the field of renewable energy, energy efficiency, sustainable water management, pollution prevention and control, clean transport, sustainable management of living natural resources and land use, green buildings, circular economy and other climate change adaptation activities. Following this, the first sovereign green bond was issued in April 2023, a 7-year bond worth $2.5 billion, aimed at financing/refinancing eligible green projects in the country.

In December 2021, the Banking Regulation and Supervision Agency (BRSA), the related institution of the MoTF, unveiled the Sustainable Banking Strategic Plan (2022-2025).206 This plan aims to effectively manage climate-related financial risks, foster sustainable finance, and enhance collaboration among all relevant parties to advance green banking in Türkiye. To fulfill its purpose, establishing the data infrastructure required for risk management, enhancing banks' risk management capacity, and reinforcing the supervision and monitoring framework are of paramount importance. BRSA also published the Guidelines on

[205] The Document can be found at https://ms.hmb.gov.tr/uploads/2021/11/Republic-of-Turkey-Sustainable-Finance-Framework.pdf

[206] The Strategic Plan is accessible at https://www.bddk.org.tr/KurumHakkinda/EkGetir/19?ekId=143

Credit Allocation and Monitoring207 in June 2021 which incorporates environmental, social and governance factors and related risks into the banking sector's credit risk management policies and procedures. Recently, the BRSA has drafted the Communiqué on Green Asset Ratio208, which is planning to be published at the end of 2024, to specify the economic activities that contribute to green transformation and to enablebanks to generate comparable and reliable data on green assets, as well as to perform self-assessments of their green banking activities.

In October 2020, the Capital Markets Board (CMB), the related institution of the MoTF, introduced the Sustainability Principles Compliance Framework209, initiating sustainability reporting for publicly listed companies. The Framework's content and its 'comply or explain' implementation approach have sparked greater interest and awareness among corporations regarding potential sustainability initiatives and the importance of developing a sustainability profile. In February 2022, the CMB issued the Guide for Green Debt Instruments, Sustainable Debt Instruments, Green Lease Certificates, and Sustainable Lease Certificates210. Aligned with International Capital Market Association principles, the Guide classifies green projects based on environmental objectives and uses evidence-based criteria for other sustainability issues.

As another important milestone in creating a robust green ecosystem in the country, Public Oversight, Accounting and Auditing Standards Authority, the related institution of the MoTF, published the Turkish Sustainability Reporting Standards (TSRSs) and Scope of Application of TSRSs211 in December 2023. This regulation, in line with international standards, aims to ensure the disclosure of information on sustainability and climate-related risks and opportunities by certain entities under its scope. Following the regulation, the steps for implementing a uniform training program nationwide have been taken to build capacity in corporate sustainability reporting.

---

207 The Guidelines can be found at https://www.bddk.org.tr/Mevzuat/DokumanGetir/1068

208 For the Draft (in Turkish), please visit https://www.bddk.gov.tr/Mevzuat/DokumanGetir/1195

209 See the Framework at https://cmb.gov.tr/data/62816f571b41c617eced1005/c1fad28f78a657e385ba3d2d94b2eee6.pdf

210 The Guidelines is accessible at https://cmb.gov.tr/data/628164d41b41c617eced0ff0/c271c36f7bbd4a9429b0d503626c43d1.pdf

211 The Standards can be found at https://www.kgk.gov.tr/SustainabilityDetailForm/11455/Raporlama%20Standartlar%C4%B1

Türkiye Green Taxonomy legislation has been developing under the coordination of the DoCC, as part of the Green Deal Action Plan. At the meeting of the Climate Finance Working Group held in May 2024, the members of the Board were presented with a roadmap outlining the course of action to be followed with regard to taxonomy activities. In order to ensure the widest possible input, 15 sectoral online meetings were held with representatives from both public and private sectors. Following a multi-stakeholder preparation process, the relevant legislation is scheduled for implementation in 2025.

Besides above-mentioned actors, the line ministries and other relevant public agencies play a crucial role in the institutional mechanism since they are tasked with sectoral policy oversight and executing investment and capacity-building projects in their domains. These institutions are the main actors in the assessment process of the financing and capacity building needs related to climate change. In this context, all the aforementioned institutions in Türkiye are working together to achieve climate change objectives and fulfill international commitments under the UNFCCC and the Paris Agreement, including climate finance reporting.

7.1.2 COUNTRY-DRIVEN STRATEGIES

Türkiye has advanced significantly its climate change agenda, driven by both domestic and international factors that have strengthened the country's climate commitments and ambitions since 2021, notably after ratifying the Paris Agreement. In that period, Türkiye has incorporated its climate change ambition into its core policy documents and economic growth model, and has formulated various strategies and action plans addressing climate and green transition at macroeconomic and sectoral levels. Key policy documents that recently encompass short, medium, and long-term climate change actions and investments in Türkiye include, but are not limited to, the Updated First NDC, the 12th Development Plan, Medium Term Program, Climate Change Mitigation Strategy and Action Plan, Climate Change Adaptation Strategy and Action Plan and other sectoral strategies.

In 2023, Türkiye revised its NDC, aiming to lower GHG emissions by up to 21% by 2030 compared to the business-as-usual (BAU) scenario. In the Updated First NDC of Türkiye, the country aim to reduce GHG emissions by 41% compared to BAU between 2023 and 2030, nearly doubling the previous target.212 This NDC, an

[212] For the updated first NDC of Türkiye, please visit https://unfccc.int/sites/default/files/NDC/2023-04/T%C3%9CRK%C4%B0YE_UPDATED%201st%20NDC_EN.pdf

economy-wide document, has dedicated chapters for both mitigation and adaptation policies. In the mitigation section, policy measures are included for the areas of energy, industry, transport, agriculture, buildings, waste, and land use, land use change, and forestry (LULUCF). In this NDC, Türkiye recognizes carbon pricing mechanisms, particularly the Emissions Trading System (ETS), as economically efficient mitigation strategies and primary tools for the industry and energy sectors. The country has announced its plans to implement an ETS and has been developing the legislative and institutional structures required for this purpose.

Regarding adaptation strategies, Türkiye's Updated First NDC addresses the main policies and targets in the field of agriculture and forestry, waste, disaster risk management, urban, rural development, and public health. Türkiye has implemented substantial steps for climate change adaptation and is committed to strengthening its work in various areas. These include assessing impact, vulnerability, and risk, developing information systems, employing legal and political instruments at both national and local levels and carrying out capacity building, monitoring and financing studies.

As indicated in its Updated First NDC, Türkiye has declared that its GHG emissions will peak in 2038 and then it will achieve net-zero emissions by 2053, which requires a great deal of climate finance and technological investments. Besides, Türkiye is currently preparing a long-term low-emission development strategy compatible with its development plans that will further identify future actions to address climate change.

Climate change, green transformation and finance are among the priorities of the 12th Development Plan for 2024-2028 and the Medium-Term Program (MTP) covering the years 2025-2027. Announced in November 2023, the 12th Development Plan213 serves as a crucial policy framework for sustainable development and climate change actions of Türkiye. Within its five primary axes, key climate-related objectives mainly fall under the headings of competitive production through green and digital transformation, disaster-resilient habitats and sustainable environment. According to the 12th Development Plan, Türkiye aims to reach net-zero emissions by 2053 by implementing measures in sustainable natural resource management, energy transition, green infrastructure, circular economy investments, environmental protection, and promoting domestically

213 For further details on the 12th Development Plan, please see https://www.sbb.gov.tr/wp-content/uploads/2024/06/Twelfth-Development-Plan_2024-2028.pdf

produced green technologies. 12th Development Plan also emphasizes accelerated efforts to finance green transformation, particularly in areas such as legislative frameworks, taxonomy, MRV driven by initiatives to create sustainable and green financial products. It anticipates the regular production and sharing of environmental datasets and indicators aligned with international standards, along with the development of monitoring and evaluation systems. Additionally, under the mentioned Plan, a data infrastructure will be established to enhance the quality and transparency of environmental data reporting, ensuring it is comparable and reliable, in compliance with international conventions to which Türkiye is a party.

The MTP214 released in September 2024 outlines various actions to assist Türkiye in meeting its Paris Agreement targets and advancing the green transition of the Turkish economy and private sector. The main purpose of the MTP in relation to climate change is to accelerate green transition for sustainable growth and to this end policies will be implemented to strengthen international compliance, increase the use of renewable energy sources, and enhance energy efficiency.

Türkiye is transitioning towards a sustainable, resource-efficient, and green economy. Türkiye, as a developing country, has been fulfilling its responsibility in dealing with climate change. Over the past decades, substantial investments in the country have been strategically channelized towards GHG emissions reduction across all sectors and development of a robust and climate-resilient infrastructure, ensuring our long-term sustainability and preparedness for the challenges posed by climate change. However, to successfully implement the actions outlined in the country's strategies, a large scale of climate finance is necessary, along with enhanced technology development and capacity-building initiatives. Addressing Türkiye's financing needs and bridging the gaps are crucial for achieving mentioned ambitious climate targets.

On the other hand, recent climate related disasters have demonstrated the necessity to rally more resources to finance Türkiye’s adaptation and resilience efforts against this global crisis. For instance, ESCAP estimates that under different climate change scenarios (baseline, 1.5 degrees, and 2 degrees), the average annual loss from climate disasters could reach approximately 1.7-1.8% of Türkiye's GDP.215 Türkiye is particularly vulnerable to the water scarcity which threatens

214 MTP (in Turkish) can be accessed via https://www.sbb.gov.tr/wp-content/uploads/2024/09/Orta-Vadeli-Program_2025-2027.pdf

215 https://rrp.unescap.org/country-profile/TUR

crop production, fishing, and aquaculture. Even a modest 10% reduction in water supply could potentially result in a loss of about 6% of Türkiye's GDP, roughly $50 billion.216

In the last decades, although Türkiye has made significant investments for building a climate resilient infrastructure, predominantly with its own resources, this will definitely not be sufficient to meet the adaptation finance needs of the country considering the huge financial gap. In addition to its national budgetary sources and limited domestic private sector's funding, external funding, primarily provided from international financial institutions, bilateral agencies, climate funds, and private banks plays a vital role in helping Türkiye achieve its climate targets. However, the funding from these institutions is typically not in the form of concessional loans or grants; instead, private finance remains the primary source of funding for the country's climate actions, especially concentrated in mitigation sectors.

Moreover, certain features of adaptation investments present some stumbling blocks to boosting adaptation financing. The substantial investment requirements of adaptation projects, coupled with their long-term and low financial returns, make them less attractive for traditional financing. This scenario particularly discourages private sector involvement and investment in adaptation projects, thereby restricting funding in this area. Nevertheless, the significant social and environmental benefits of these investments make them more appealing for public funding. Blended finance could play a crucial role in catalyzing more investments and unlocking more private investment in the adaptation sector. International public concessional financing at an increasing rate is the main driver to this end by providing opportunities for building the capabilities to access and utilize climate finance to address and alleviate the negative impacts of climate change.

7.1.3 UNDERLYING ASSUMPTIONS, DEFINITIONS AND METHODOLOGIES

Climate finance plays a critical role in supporting mitigation, adaptation and resilience efforts of Türkiye to achieve its NDC and 2053 net-zero emissions target. Being a cross-cutting issue, climate change finance overlaps with multiple sectors, making it challenging to clearly identify and track the resources addressing this global crisis. Climate finance also lacks a universally agreed-upon definition and therefore it's difficult to determine precisely which resources, funds, and projects solely fall under its scope. Even some investment projects, not specifically or

216 Türkiye CCDR, June 2022.

directly dealing with climate change, can have certain climate-related elements and components. In addition, the scattered nature of climate finance, provided by a variety of public and private sources including developed countries, international financial institutions, and particularly the private sector, contributes to this uncertainty. Moreover, there is no global or harmonized MRV system for climate finance. While under the Paris Agreement, a common reporting format has been established, Türkiye likewise all other developing countries need technical assistance and sufficient time to strengthen their capacities to comply with this standardized and harmonized reporting approach.

Having accessible, high-quality, reliable, and consistent climate finance data across countries is essential for improved tracking, measurement and management of activities, outcomes, and impact. However, developed countries and international financial institutions report climate finance using their own criteria and modalities (such as OECD DAC handbook on the Rio markers for climate change mitigation and adaptation, MDB climate change tracking framework) leading to varying figures across different institutions and platforms. Without a harmonized approach, there is a risk of double counting, where the same financial flows are reported by multiple actors, leading to inflated estimates of climate finance.

Given the mentioned limitations and challenges, there is no commonly-used methodology and mechanism to track and report public and private investments regarding their climate components in Türkiye. Under its Updated First NDC, Türkiye categorizes actions and targets by sector. The country has identified mitigation actions across relevant sectors such as energy, industry, transport, agriculture, building, waste, and LULUCF. However, the exact share of climate components and investments under these actions is not predicted due to the absence of a common tracking methodology. Similarly, the adaptation section of the NDC outlines measures under specific sectors, but encounters the same challenge. This sectoral approach is also observed in other climate change strategies and action plans, like the Climate Change Mitigation Strategy and Action Plan.

Regarding the budgetary and public expenditure policies, Türkiye has been using the performance-based program budget system since 2021. Although this system does not directly address climate change, it paves the way for the implementation of green budgeting. Climate and environment-related programs such as sustainable environment and climate change in the central government

budget serve this purpose. Türkiye has put green budgeting on its agenda since 2021. Within the scope of budget preparations for the 2025-2027 period, authorities are expected to develop indicator proposals on environment, combating climate change, energy efficiency, carbon emissions, resource efficiency, low-carbon production, clean technology, circular economy, agriculture and food security in line with the country's 2053 net zero emission target and national green transformation strategy. However, for the time being, due to the lack of green labeling in the course of investment and budget planning and program process, climate financing tracking face challenges leading to inadequate reporting on green financing.

The MoTF, as mandated by Law No. 4749 on "Regulating Public Finance and Debt Management", oversees sovereign bond issuances in the international capital markets, externally funded public projects, and budget financing through international loans. It publishes Public Debt Management Reports (PDMR) detailing financial asset and liability management. Monthly PDMRs include statistics on external debt, both treasury guaranteed and non-guaranteed, and loan agreement details like project names, lenders, and amounts. However, these reports lack sector-specific breakdowns of external financing, making it impossible to track climate finance received from external creditors and institutions under current reporting practices.

For ensuring transparency and meeting the reporting requirements under the UNFCCC and the Paris Agreement, the DoCC compiles necessary information and data from various public institutions and stakeholders into a standardized table format, following the relevant COP decisions.

The reporting period/time frame mirrors both current and anticipated needs for 2030, consistent with the country's updated first NDC, when determining the required level of support. To offer long-term predictability, this report may include investment needs from the relevant sectoral projection studies conducted for guiding the country's 2053 net-zero emission target.

The estimated investment needs in dollar terms are based on the dollar value given in the referred studies and do not involve any conversion using the TL/Dollar exchange rate for the figures presented in the following sections.

7.2 INFORMATION ON FINANCIAL SUPPORT NEEDED

7.2.1 OVERVIEW

At this stage, more comprehensive analyses mirroring the costs and investment needs of the mitigation and adaptation measures specified in the NDC and the relevant strategies and action plans are required in Türkiye for ensuring a complete reporting of the support required across all areas, particularly for adaptation. While some sector-specific assessments and planned works offer insights into costs and investment needs, particularly for mitigation, research to determine economy-wide data is still underway. Investment analyses at the sectoral level, particularly in energy, industry and transport, shed light on Türkiye's finance needs in these areas in relation to the emission reduction targets set in the NDC.

In addition to the costs of mitigation actions, identifying the investment needs for adaptation actions is also crucial for the country's future path for the investment planning and resilience strategies. Climate change adaptation requires significant investments to get resilience against the adverse impacts of rising temperatures, changing weather patterns, and other environmental shifts. However, determining the precise investment needs for adaptation poses several difficulties due to limited data available on climate impacts and vulnerabilities, and multifaceted aspects of adaptation measures that span multiple sectors (e.g., agriculture, infrastructure, health), requiring integrated and coordinated planning. Moreover, conducting cost-benefit analyses for adaptation projects is complex due to the long-term nature of climate impacts and the difficulty in quantifying benefits.

Ongoing and planned investment in Türkiye directly or indirectly address climate change adaptation through sectoral policies, particularly in the areas such as urbanization, water and disaster management, agriculture, public health, tourism and transport. It's crucial to estimate the costs of adaptation measures outlined in the Updated First NDC and the National Climate Change Adaptation Strategy and Action Plan, while exploring both domestic and international funding options.

Türkiye has considerable financial and investment needs for implementing its enhanced mitigation and adaptation actions. According to an assessment made in the 12th Development Plan to illustrate the climate finance gap, it is estimated that the amount of annual additional investments needed to achieve the net zero emissions target by 2053 in Türkiye is equivalent to at least 1.7 percent of Gross National Income in the energy, building, industry, transport, agriculture and forestry sectors, with about 1 percentage point from the private sector and 0.7 percentage points from the public sector. According to this Plan, investments in renewable energy, electrification, energy efficiency, green hydrogen, and energy storage will be crucial for meeting the 2053 net-zero target. The growth in

solar and wind power sectors is substantial, and the country is determined to encourage investments in equipment.

The World Bank's Türkiye Climate Change Development Report (CCDR)217 examines the investment needs and costs for a pathway to achieve net zero emissions by 2053. According to the findings of the CCDR, Türkiye would need to invest an additional $68 billion during 2022-2030, representing 1.0% of the discounted cumulative GDP for this period. This figure rises to $165 billion (1.2% of the discounted cumulative GDP) over 2022-2040. These investments represent a 21% increase over the existing $319 billion required in key sectors between 2022-30 (power: $52 billion, residential: $243 billion, transport: $24 billion), and a 34% increase over the $482 billion needed between 2022-2040. About half of these investments is expected to come from the private sector. Additional annual public investment needs in these sectors could be around $5 billion until 2025, and $6 billion by 2030.

The following section presents data on the potential investment cost projections and investment priorities for the actions and policy measures outlined in the strategies, action plans, and roadmaps released by Turkish public institutions to date, aimed at achieving NDC targets. Aligning with the country's 2053 net-zero emission target, the identified needs and priorities for certain climate change actions go beyond the 2030 timeframe specified in the Updated First NDC and may extend up to 2035 or 2053.

7.2.2 MITIGATION RELATED NEEDS

7.2.2.1 Energy Sector

Investment needed in renewable energy to achieve the targets set out in the National Energy Plan is estimated around $73 billion by 2035. Thanks to these investments, a system based on renewable energy sources with a total capacity of 74,353 megawatts is planned to be put into operation.218

During the COP28 in 2023, as a more ambitious step beyond its NDC and National Energy Plan, Türkiye unveiled a target to deploy 60 GW of renewable energy by 2035, one of the most significant plans among developing countries aside from China and India. Meeting this target will require actions in power generation, distribution, and transmission, with an estimated $100 billion investment required, according to the World Bank.219 The investment requirements for the transmission

---

217 CCDR and its background notes can be found at https://openknowledge.worldbank.org/entities/publication/01826a0c-059f-5a0c-91b7-2a6b8ec5de2f

218 https://www.aa.com.tr/tr/enerjiterminali/yenilenebilir/turkiye-yenilenebilir-enerjiye-2035e-kadar-73-milyar-dolar-yatirim-yapmayi-planliyor/41752

219 https://www.worldbank.org/en/news/opinion/2024/02/20/turkish-firms-path-to-growth-and-market-share-lies-in-green-solutions

and distribution system are estimated to be $8 billion over 2022-2030 and an additional $14 billion over 2030-2040.220

Lately, the Minister of Energy and Natural Resources has also announced an enhanced goal to increase Türkiye's renewable energy installed capacity by 2.5 times from 30 GW to 100 GW in wind and solar by 2035.221 In this context, Türkiye aims to meet its near-term energy efficiency, renewable energy, and energy technology goals by investing approximately $59 billion in renewables, $2.5 billion in storage, and $4.1 billion in demand response by 2035.

To achieve the targets under the Energy Efficiency 2030 Strategy and the Second National Energy Efficiency Action Plan, an estimated $20.2 billion in public and private investment is expected to be generated for energy efficiency (including energy efficiency-oriented investments, improvement programs and incentive practices) between 2024-2030. Out of the planned $20.2 billion investment, the public will contribute $5 billion through tax and incentive programs. The rest is expected to come from private sector investments, driven by the leverage effect and both national and international private financing.

Table 38 - Projected energy efficiency investments between 2024-2030 under the Second National Energy Efficiency Action Plan

	2024	2025	2026	2027	2028	2029	2030
Investments (Million $)	2.452	2.656	2.544	2.513	3.086	3.227	3.574

7.2.2.2 Industry Sector

While a comprehensive investment cost analysis encompassing the entire industrial sector in relation to the NDC target is lacking, numerous studies have been undertaken to assess the costs and requirements for specific sub-branches within Turkish industry. Harnessing the vast potential of waste heat is critical in combating climate change, as it offers a significant opportunity to reduce energy consumption and lower greenhouse gas emissions. The Türkiye Waste Heat Potential Assessment Project, supported by the World Bank, identifies a potential of 1,600 kTOE (1,000 TOE) of waste heat in the industrial sector, needing around $1.37 billion in investment, and a cogeneration capacity of 2,515 MWe, requiring about $2 billion in investment.

Türkiye pays particular attention to the EU's CBAM, given that the EU is its largest trade partner, accounting for 41% of Turkish exports, and Türkiye ranks as the 7th biggest trade partner for the EU. Additionally, according to data for the year 2022, Türkiye is the 8th largest steel producer globally. Iron and steel sector is of most

[220] Türkiye CCDR, June 2022.

[221] https://enerji.gov.tr/haber-detay?id=21361

concern because nearly 40% of Türkiye's export likely to be subject to CBAM and aluminum is also exposed with 58% of exports going to the EU.222

Türkiye's close trade relations with the EU, particularly in the sectors covered by the CBAM (iron and steel, cement, aluminum, fertilizers, electricity, and hydrogen), necessitated an analysis of the effects of this mechanism on Turkish economy and export. Several studies exploring these effects and cost analysis have been carried out by some public institutions in coordination with the MDBs. One analysis223 indicates that the iron and steel, cement, and chemical products/aluminum sectors would together bear the majority of the cost, accounting for approximately 65-70% under the CBAM (if CBAM is extended). Depending on the domestic carbon price levels and the CBAM carbon prices, the potential annual CBAM costs to industry could be €138 million in 2027 (for the certificate price of €75/tCO2e) and for higher CBAM prices this cost could be €2.5 billion annually by 2032 (for the certificate price of €150/tCO2e). For example, in the scenario of a higher domestic carbon price at €50/tCO2e, the CBAM charges would drop to €1 billion annually by 2032, reducing the CBAM costs by €1.5 billion.224

In alignment with Türkiye's 2053 net zero emission target, the country has developed sector-specific low-carbon roadmaps for certain CBAM sectors, such as cement, steel, aluminum, and fertilizers. These roadmaps outline advanced techniques, clean technologies, policy measures, and financing requirements.To align with this target, the goal is to reduce emissions by 75% in the aluminum sector, 99% in the steel sector, 93% in the cement sector, and achieve net zero emissions in the fertilizers sector.

In this regard, "A Low Carbon Pathway for the Cement Sector in the Republic of Türkiye"225 was announced in January 2024. As an important sector for the country, Turkish share in EU cement import and the EU's share in Türkiye's total cement export are quite large.226 Modeling results indicate that Türkiye's cement sector needs to transition to alternative raw materials and fuels, as well as undergo technological changes to meet ambitious emission reduction targets. Improving thermal and energy efficiency, adopting hydrogen technologies,

222 Türkiye CCDR, June 2022.

223 Climate Focus (in cooperation with MoEUCC and supported by EBRD), The Potential Impact o f CBAM on Turkish Economy, March 2023, https://iklim.gov.tr/db/turkce/haberler/files/20230523%20Impacts%20of%20CBAM%20on%20Turkiye%20phase%202%20report%20FV3%20(2)-sayfalar-1,3,5-16%20(1)%20(1).pdf

224 The Potential Impact of CBAM on Turkish Economy, March 2023.

225 The report can be accessed at https://www.sanayi.gov.tr/merkez-birimi/6f188a931f68/projeler/b81284

226 By value, Türkiye's cement exports accounted for 8.7% of the EU's cement imports in 2022, whi ch is equivalent to approximately $266 million. EU countries represented 16.6% of Türkiye's total c ement exports by tonnage.

investing in renewable energy, and implementing carbon capture, utilization, and storage (CCUS) are critical areas for the sector to achieve net-zero emissions. The total nominal investment cost for transitioning Türkiye's cement industry is estimated to be between $29.8-30.7 billion across different scenarios from 2023 to 2053. CCUS investments represent 90% of the overall costs.

In accordance with "A Low Carbon Pathway for the Steel Sector in the Republic of Türkiye,"227 released in October 2023, the sector could reach the net zero emission goal by integrating green hydrogen and CCUS technologies, and supplementing with biomass as a fuel source. From 2023 to 2053, achieving this goal will require average yearly investments of $0.8 to $1.1 billion in decarbonization technologies in the sector. To achieve net zero emissions in that period, total investments are anticipated to be approximately $31.4 billion, with 32.7% of this cost dedicated to converting existing capacities.

"A Low Carbon Pathway for the Aluminum Sector in the Republic of Türkiye"228, presented in October 2023, emphasizes the necessity of investing in the technological upgrade of existing furnaces and the construction of new ones. The total investment cost is projected to be $4.82 billion to reach net zero emissions by 2053.

The fertilizers sector's decarbonization is projected to require total investments of $5.3 billion until 2053 according to "A Low Carbon Pathway for the Fertilizer Sector in the Republic of Türkiye"229, dated October 2023. In the scenario, renewable energy represents the largest investment, followed by heat pumps, organic fertilizers, and green ammonia.

7.2.2.3 Transport Sector

Railway investments under the National Transport and Logistics Master Plan are estimated around $29 billion (in 2019 prices).230 As part of its 2053 vision, Türkiye intends to invest total $198 billion in transportation and communications infrastructure, including rail, road, maritime, and air by 2053231 Out of this figure, $70 billion to be invested in railway sector for 8.554 km long railway construction.

227 The report can be found at https://www.sanayi.gov.tr/merkez-birimi/6f188a931f68/projeler/b81284

228 See the report at https://www.sanayi.gov.tr/merkez-birimi/6f188a931f68/projeler/b81284

229 For further information, please visit https://www.sanayi.gov.tr/merkez-birimi/6f188a931f68/projeler/b81284

230 Republic of Türkiye Updated First NDC

231 https://www.uab.gov.tr/haberler/ulastirma-ve-altyapi-bakani-karaismailoglu-2053-ulastirma-ve-lojistik-ana-plani-ni-acikladi

By 2040, $20 billion should be allocated to transport electrification to stay on track for the 2053 net-zero emissions target.232

Besides railway investments, electric vehicles play a crucial role in combating climate change by offering a significant means to lower transportation-related emissions and minimize the dependence on fossil fuels, thereby contributing to a more sustainable and environmentally friendly future. To meet the charging requirements of an expected 2.5 million vehicles, about $1 billion is estimated to be invested in charging infrastructure by 2030, and total investment will likely increase to $2 billion by 2035.

7.2.2.4 Building Sector

While there are no specific investment cost analyses for Türkiye in this sector, estimates suggest that achieving net zero by 2050 would necessitate an average annual investment of $700 billion in existing buildings at global level. Considering the existing building stock and the risks of natural disasters, including earthquakes, Türkiye's share in these investments is expected to be substantial.

7.2.2.5 Agriculture Sector

An analysis of total investment costs for Türkiye's climate actions under the agriculture sector as a whole is not available. Although the investment costs and timelines outlined in the Strategy and Action Plan for Combating Agricultural Drought are undetermined, it is planned that relevant institutions will separately prepare cost estimates and schedules to outline the approximate investments and timeframes needed for drought mitigation.

7.2.2.6 Waste Sector

While the investment costs associated with climate targets for the waste sector are not yet clear, previous estimates could provide insight into the magnitude of the investment needs of the country. The Draft National Waste Management Strategy and Plan (2024-2035) is illustrated the public investment requirements for waste management initiatives, which encompass facility investments in recovery, pre-treatment, intermediate storage, and disposal methods for various waste types.233

7.2.2.7 Land Use, Land Use Change, and Forestry (LULUCF) Sector

Assessing the investment costs needed to meet climate goals within the LULUCF scope will provide a more precise and targeted approach to the future actions. Some cost analyses have been performed by the World Bank regarding the sector, with a special emphasis on forestry. The Bank estimates that Türkiye's forest

---

232 Türkiye CCDR, June 2022.

233 The National Waste Management and Action Plan 2023, https://webdosya.csb.gov.tr/db/cygm/haberler/ulusal_at-k_yonet-m--eylem_plan--20180328154824.pdf

landscapes initiatives will require an additional $2 billion for restoration, reforestation, and fire management between 2022 and 2030, with this need potentially rising to $3 billion by 2040.234

7.2.3 ADAPTATION RELATED NEEDS

An analysis of total investment costs for Türkiye's climate adaptation actions as a whole or sectoral basis is not available yet. Several initiatives and studies have been already started to make an assessment of adaptation investment financing needs on sector and program basis. Estimating adaptation finance needs requires robust data, modeling, and technical capacity. Because there is no national level single quantitative goal for adaptation and defined metrics, assessed costs of adaptation vary as they are calculated against varied climate scenarios and baselines. International studies on adaptation costs for developing countries provide a basis for several parameters that can help forecast Türkiye's adaptation finance needs.

There are several international reports that developed methodologies for the estimation of the adaptation financing needs of developing and emerging market economies based on various macro indicators. As emphasized by certain studies, countries face different adaptation costs according to their income levels. The UNEP Adaptation Gap Report 2023 reveals that annual per capita adaptation needs for upper-middle income countries are $81 on average, while in lower-middle and low-income countries the annual per capita needs are $51 and $22, respectively. Based on this approach, the average annual adaptation cost for Türkiye, as an upper-middle income country, is estimated to be $6.89 billion. According to this Report's findings, when expressed as a percentage of GDP, adaptation costs are estimated as 3.5% for low-income countries, 0.7% for lower-middle-income countries and 0.5% for upper-middle-income countries. Based on this approach, the adaptation costs for Türkiye is expected to be around $5 billion per year.

The cost estimates presented above only aim to provide a crude insight into the needs assessment in this area based on various approaches. The overall funding required for adaptation will need to be further studied and refined with detailed feasibility and cost-benefit analysis conducted by the relevant government agencies, factoring in the expenses of pertinent projects and planned initiatives outlined in major policy documents like the NDC and the Climate Change Adaptation Strategy and Action Plan.

234 Türkiye CCDR, June 2022.

Table 39- An overview of estimated investment needs in selected sectors in line with for Türkiye's Updated First NDC and other climate targets including 2053

Sector	**Programme/project desccription**	**Estimated amount (USD)**	**Expected time frame**	**Type of Support**	**Expected use, impact and estimated results**
Energy	Achieving renewable energy targets set out in the Updated First NDC and National Energy Plan	73 billion	By 2035	Mitigation	Reaching a total renewable energy capacity of 74,353 megawatts
Energy	Attaining energy efficiency targets under the Energy Efficiency 2030 Strategy and the Second National Energy Efficiency Action Plan	20.2 billion	2024-2030	Mitigation	Reaching a cumulative final energy saving of 37.1 MTOE
Industry	Enhancing thermal and energy efficiency, embracing hydrogen technologies, investing in renewables, and implementing CCUS	29.8-30.7 billion	2023-2053	Mitigation	Reducing GHG emissions in cement sector by 93% until 2053
Industry	Advancing technology for existing furnaces and the construction of new ones	4.82 billion	2023-2053	Mitigation	Reducing GHG emissions in aluminum sector by 75% until 2053

Industry	Blending green hydrogen and CCUS technologies, and complementing with biomass for fuel	31.4 billion	2023-2053	Mitigation	Reducing GHG emissions in steel sector by 99% until 2053
Industry	Mobilizing investments for renewable energy, heat pumps, organic fertilizers, and green ammonia	5.3 billion	2023-2053	Mitigation	Achieving net zero in fertilizers sector by 2053
Industry	Achieving 1,600 kTOE (1,000 TOE) of waste heat and a cogeneration capacity of 2,515 Mwe	3.37 billion	N/A	Mitigation	Reducing energy consumption and GHG emissions by utilizing the untapped potential of waste heat
Transport	The construction of a total of 4,690 km of railway routes, with 4,088 km designated for high-speed trains The construction of a total of 8,554 km of railway routes	29 billion 70 billion	2030 2053	Mitigation	Significant GHG emissions reduction by expanding the electrified rail network
Transport	The installation of 251,000 charging sockets and supporting infrastructure	1 billion 2 billion	2024-2030 2024-2035	Mitigation	Meeting charging requirements of an expected 2.5 million vehicles

Forestry	The forest landscapes initiatives for restoration, reforestation, and fire management	2 billion 3 billion	2023-2030 2023-2040	Mitigation	Protecting and increasing forest assets and making them climate resilient

7.3 INFORMATION ON FINANCIAL SUPPORT RECEIVED

Besides the national budgetary resources and mobilization of domestic private funds, Türkiye receives external funding from international financial institutions and bilateral agencies for the projects to support mitigation and adaptation efforts, targeting sectors like energy, industry, agriculture, transport, and building. These resources involve sovereign bond issuances in the international capital markets, MDAs and bilateral financing institutions loans and grants, export credits, guarantee, equity and de-risking instruments for public investment and capacity building projects. To fund its growing climate investment needs, the government has partnered with various bilateral and multilateral development institutions, such as the World Bank Group, European Bank for Reconstruction and Development (EBRD), Asian Infrastructure Investment Bank (AIIB), Islamic Development Bank (IsDB), Council of Europe Development Bank (CEB), Japan Bank for International Cooperation (JBIC), German Development Bank (KfW) and French Development Agency (AFD). Growing negative effects of climate change, evident in recent droughts, floods, and wildfires in Türkiye, have led to enhanced financing partnerships with these institutions, especially the World Bank, for adaptation purposes.

Instruments beyond traditional debt tools aimed to be deployed, including Public-Private Partnership models, results-based finance, local currency debt, and guarantees. Non-market rate instruments are essential for enabling investments where high risks prevent market rate capital investments. It will be essential to enhance the overall efficiency and impact of the concessional finance by achieving the right balance between grants and loans, and prioritizing the most concessional support to the projects with the greatest needs. In this respect, concessional capital in particular grants obtained from MDBs and Climate Funds is also critical for leveraging private sector investments. Having considered low bankability nature of the adaptation activities, highly concessional or grant-based finance is most-needed in adaptation.

Recently, guarantee instruments are becoming increasingly important to address the growing climate finance needs of developing countries, as bilateral donors and multilateral development banks and public funds alone lack sufficient resources to meet these demands. These instruments can play a crucial role in lowering risks, attracting private sector investment, and speeding up the transition to a low-carbon economy. These financial tools offer investors assurances that their investments are shielded from certain risks, including political, credit, and performance risks, thereby increasing investor confidence in climate-related projects. Guarantees help public funds to secure a much larger private investment and multiplying the impact of public funds. For instance, new and innovative climate technologies often come with higher risks and uncertainties;

guarantees can provide the necessary risk mitigation to spur investment in these technologies, driving innovation and technological growth.

In October 2021, a Memorandum of Understanding (MoU) was signed between Türkiye and its development partners including the World Bank (IBRD and IFC), Germany, France, the EBRD, and the UN to provide the country with approximately $3.2 billion in climate financing for three years. The MoU is designed to foster Türkiye's sustainable development actions in line with its NDC, specifically focusing on its commitment to low-emission and climate-resilient development, in alignment with the international pledges made under the Paris Agreement and its 2053 vision.

This funding supports Türkiye's climate change investments across various sectors, including energy, industry, agriculture, land use, forestry, sustainable waste management, urbanization, transport, along with cross-cutting areas like technical support and institutional/regulatory issues.

Apart from the financing at the market conditions going to private sectors' operations under the MoU, the table below compiles data on climate-related finance provided to Turkish public institutions and agencies under this Memorandum.

Table 40 - Financial support received by the public institutions under the MoU

Title of activity, programme, project or other	Programme, project desccription	Channel	Implementing entity	Amount received (USD*)	Time frame	Financial Instrument	Type of Support	Sector	Status of Activity	Use, impacts and results
Türkiye Water Circularity and Efficiency Improvement Project	In partnership with the World Bank, the project aims to improve wastewater services and reuse; to increase irrigation services and efficiency; and to strengthen institutional capacity and coordination for managing water circularity and point source pollution reduction in selected water-stressed areas in Türkiye.	Multilateral	The General Directorate of State Hydraulic Works (DSI) and ILBANK	435,000,000	2023-2030	Concessional loan	Adaptation	Water and Sanitation	Ongoing	The Project will enable more than 1 million people to access improved wastewater collection and treatment services and reduced environmental pollution, and nearly 5,000 farmers to benefit from improved access to irrigation services.

Public and Municipal Renewable Energy Project for Türkiye	In partnership with the World Bank, the project will support Türkiye to scale-up renewable energy use in the public sector by focusing on central government and municipal facilities. In addition to the loan amount, the project includes a grant amounting USD 3 million provided under the Energy Sector Management Assistance Program.	Multilateral	MoEUCC and ILBANK	549,000,000	2023-2028	Concessional loan	Mitigation	Other (specify)	Ongoing	The project will assist the country in meeting its climate mitigation goals and will support national endeavors to decarbonize the building sector.

Rural Housing Reconstruction and Recovery Program	The objective of the project, which is under appraisal of the AFD , is to support the climate and disaster-resilient reconstruction of collapsed, heavily damaged rural houses, livelihood buildings, and associated repair and/or reconstruction of basic infrastructure and social facilities.	Bilateral	MoEUCC	164,730,000	N/A	Concessional loan	Adaptation	Other (specify)	Planned	The planned project will support Türkiye's adaptation to climate change and green recovery through helping the country build climate and disaster resilient housing and infrastructure in rural areas and enhance technical capacity of the MoEUCC.
Municipal Drinking Water Project	The project helps the municipality supply clean and safe drinking water to meet the increasing demands of the population and industry in the city of Bursa. Credit Facility Agreement (€73 million) was signed between AFD and BUSKİ in October 2023.	Bilateral	Bursa Metropolitan Municipality - Water and Sewage Administration (BUSKİ)	80,168,600	N/A	Concessional loan	Adaptation	Water and Sanitation	Planned	The Project will support the municipality's adaptation and green transition actions through improving reliability and quality of drinking water services and reducing energy

										intensity in the water supply network.
Municipal Waste Water Treatment Project	The project, which is under appraisal, will support ASKİ's ability and capabilities to improve wastewater treatment/sewerage services in the city of Ankara.	Bilateral	Ankara Metropolitan Municipality - Ankara Water and Sewerage Administration (ASKİ)	148,257,000	N/A	Concessional loan	Adaptation	Water and Sanitation	Planned	The Project will strengthen the municipalities climate change resilience by improving municipal services and wastewater treatment facilities.

Municipal Drinking Water and Waste Water Treatment Project	The project, which is under appraisal, aims to promote investments related to sustainable development in the water and sanitation sector by enhancing İzmir Municipalities' financial and technical capabilities. .	Bilateral	İzmir Metropolitan Municipality - Water and Sewerage Administration (İZSU)	109,820,000	N/A	Concessional loan	Adaptation	Water and Sanitation	Planned	By reducing water loss, the project will contribute to the protection of water resources, which will become increasingly scarce with climate change.
Türkiye Partnership for Market Implementation Facility Carbon Market Development Project	The project, in partnership with the World Bank, will support Türkiye in developing and implementing carbon pricing mechanisms and will enhance expertise and capacity for that purpose.	Multilateral	MoEUCC	4,950,000	2024-2028	Grant	Mitigation	Cross-cutting	Ongoing	The project will help country to reach its NDC targets in a cost effective way, through developing carbon pricing mechanisms.

Integrated watershed management in the Seyhan and Ceyhan basins	Under the project, feasibility study will be developed to identify the micro-catchment areas in the region related to biodiversity protection and problems to be addressed. A grant agreement amounting Euro 500k was signed with AFD in August 2024.)	Bilateral	The General Directorate of Forestry of the Ministry of Agriculture and Forestry	549.100	2024-2026	Grant	Adaptation	Cross-cutting	Ongoing	The project provides technical assistance to prepare feasibility of the credit line on integrated basin management for the General Directorate of Forestry. The needs of the local population and prospective activities will also be determined.

*EUR/USD exchange rate of 1.0982, as of October 7, 2024. Source: European Central Bank

7.4 INFORMATION ON TECHNOLOGY DEVELOPMENT AND TRANSFER SUPPORT NEEDED

Türkiye requires international cooperation in research, development, demonstration, and innovation, particularly in hard-to-abate sectors, to strengthen its domestic capacities and technologies. This collaboration aims to foster national innovation systems in line with IPCC findings. Achieving the long-term goals of the Paris Agreement necessitates the rapid and widespread deployment and adoption of existing clean technologies, along with accelerated innovation, digital transformation, demonstration and dissemination of new and emerging technologies. This effort must be supported by enhanced access to these technologies, along with appropriate enabling frameworks and international cooperation.

Türkiye is dedicated to investing in clean technologies, digital infrastructure and innovative solutions that are essential in confronting climate change. To achieve this, the country is implementing various initiatives to explore the technological needs and create a supportive environment that speeds up green and digital transformation. Türkiye's Updated First NDC places a special emphasis on the critical role of green technologies, R&D activities and innovative solutions to tackle climate change. Within the industry sector, Türkiye seeks to advance clean technologies and identify those needed to increase green production. In the building sector, the country is planning to increase the use of technologies such as combining heat and power, waste heat boilers, efficient lighting, green building, green boiler, green chiller, efficient electric motors, gas pipeline networks, solar PV and solar water heaters. Moreover, encouraging technology-based solutions that increase sink capacity is among the priorities of the country.

Hydrogen, carbon capture and storage and battery technologies have been mentioned among the main innovative instruments to lower industrial emissions and achieve zero emissions in the power sector. One of the noteworthy findings of the World Bank's flagship report, Türkiye CCDR, is that for a net zero pathway Türkiye needs to install 9.6 GW of battery storage by 2030, which requires a great deal of investments.

The 12th Development Plan also highlights on the support for R&D initiatives and technology transfer processes that contribute to the adoption, enhancement, and expansion of sustainable production methods and the overall green transformation of the country. Under the MTP for 2025-2027, the country aims to establish a robust digital infrastructure specifically designed to monitor and minimize the carbon footprint and environmental effects of its manufacturing sector. Additionally, Türkiye intends to support R&D and innovation in hydrogen technologies and will utilize export credit support mechanisms to finance high-tech and value-added exports, prioritizing green and digital initiatives.

Türkiye has initiated the High Technology Incentive Program (HIT-30)235, a strategic initiative aimed at establishing the country as a prominent player in the green energy and mobility technology sectors. Through this program, Türkiye seeks to foster the development and production of new-generation vehicles, advanced battery technologies, cutting-edge chip technologies, efficient solar cells, and innovative wind turbines.

The implementation of the Hydrogen Technologies Strategy and Roadmap236, marks a significant advancement towards achieving a carbon-neutral nation, with hydrogen as a key enabler. To this end, a hydrogen value chain will be developed, with electrolyzer installed capacity increasing to 2 GW by 2030, 5 GW by 2035 and 70 GW by 2053 as part of the roadmap. Türkiye's needs for hydrogen technologies are determined in this Roadmap. Accordingly, Türkiye needs to develop fuel cell, storage and distribution technologies and electrolyzers, biomass gasification demonstration systems, biogas pyrolysis systems and biogas reforming systems advanced biological/microbial H2 production technologies for green hydrogen and CCUS technologies for blue hydrogen. The data from a study on Turkish hydrogen sector suggests that a total production of 3.4 million tons of green hydrogen would require an annual investment of $3 to $4 billion by 2050.237

Table 41 - The technology needs and priorities under the Climate Change Mitigation Strategy and Action Plan

Sector	***Technology needs and priorities***
Energy	The energy sector's priorities involve promoting low-carbon production technologies and diversifying electricity generation methods. Türkiye aims to support energy sector projects, especially those focused on R&D activities related to CCUS and hydrogen technologies. Additionally, the country plans to conduct studies on modular reactors and enhance electrical infrastructure by reducing technical loss rates through the implementation of smart meters and digital systems integration. Developing a digital transformation roadmap for the energy sector is also a key priority.
Industry	The industry sector aims to prioritize the development of new technological solutions through R&D and innovation supported by national resources. This involves supporting research initiatives and innovative practices for mitigation and the projects on CCUS technologies, exploring and implementing pilot projects focused on hydrogen technology integration, and fostering research and projects centered around electrifying low and medium heat treatments within industrial domains. Additionally, the country is emphasizing support for heat pump expansion and the establishment of digital systems for energy efficiency MRV in small and medium-sized enterprises (SMEs). It is also planned to launch a digital product passport system compatible with the EU to advance the circular economy model.

235 https://hit30.sanayi.gov.tr/en/

236 The document can be found here https://enerji.gov.tr//Media/Dizin/SGB/en/HSP_en/ETKB_Hydrogen_T_Strategies.pdf

237 SHURA and Energy Policy Research Center, Techno-economic study of Turkey's production and export potential for green hydrogen, 2021.

Building	The country is planning to increase and expand the use of Building Information Modelling (BIM) tools in the design, construction and operation of sustainable, energy-efficient and low-carbon buildings.
Transport	Türkiye aims to expand high-speed and fast train networks, support micromobility infrastructure, and develop intelligent transport systems for public transport. The country also seeks to promote low/zero-emission vehicles, electrify railway, maritime, and airline ground operation vehicles, and advance domestic battery technologies for electric vehicles. Additionally, the country plans to develop the charging infrastructure and a national intelligent integrated charging and parking management interface for electric vehicles.
Waste	Türkiye plans to bolster R&D and technological infrastructure, develop thermal and biogas conversion technologies, and utilize digital applications like advanced sensors, artificial intelligence, and remote sensing to streamline waste and wastewater processes and improve energy efficiency.
Agriculture	Türkiye aims to accelerate R&D in climate-friendly, sustainable, and digital agriculture, such as using unmanned aerial vehicles, sensors, chips, robots, and software to reduce input, and to advance national technologies for small family businesses.
LULUCF	Türkiye plans to double project support level from the year 2020 to 2030, with a focus on strengthening R&D and innovation. This includes increasing research support to analyze the impact of climate change-induced damages on carbon stocks. Priorities also involve leveraging digitalization, remote sensing technologies (such as satellite-based, drone use), and robotics to boost productivity in forestry and land use. Furthermore, the country aims to promote integrated drought solutions through scientific studies and technologies, and integrate data-driven artificial intelligence into decision-making processes.

A key goal of the Green Deal Action Plan concerning technology is to strengthening the technological infrastructure for the green transition, particularly by identifying and promoting crucial technologies that align with the EU Green Deal and facilitate sustainable production. This involves analyzing technological requirements, conducting research, and fostering the development, distribution, and adoption of these identified technologies. For this purpose, a working group was established with representatives from universities, public research centers and institutes, potential manufacturers and technology development companies, academics and public institutions for carrying out studies for a needs analysis and roadmap.

As a result, Türkiye has developed the Green Growth Technology Roadmap[238], focusing on iron and steel, aluminum, cement, chemicals, plastics, and fertilizer, all critical to the country's economy and key suppliers of essential resources to major production sectors. It is a key initiative for meeting the Türkiye's climate targets by identifying clean technology needs and supporting R&D in the industry sector. The technological requirements and targets for 2026, 2030 and 2035 have been identified using a product life cycle perspective, encompassing raw

[238] See the information on the Roadmap at https://tubitak.gov.tr/tr/kurumsal/politikalar/yesil-buyume-teknoloji-yol-haritasi

materials, production methods, energy consumption, waste management, and end-of-life recovery stages.

Table 42 - Main Targets under the Green Growth Technology Roadmap

Iron and steel sector
• Advancing technologies to increase energy efficiency and designing waste management processes for recovery/utilization within the scope of intermediate iron and steel production • Development of alternative and innovative processes and methods to increase productivity within the scope of continuous casting and semi-finished product processing • Studies on steel production from scrap (Electric arc, induction and ladle furnaces) • Designing direct reduction and other alternative production methods • Dissemination of CCUS technologies
Aluminum sector
• Fostering technologies to reduce the carbon footprint of primary aluminum production • Advancing innovative technologies/methods for scrap sorting and preparation in secondary alumina production and their integration into the production process and efficiency improvement • Promoting energy efficiency in semi-finished product processing • Increasing productivity in aluminum part casting and optimization in the sector and conducting studies on energy input, efficiency and waste management • Development and dissemination of material, machinery and liquid metal process technologies in aluminum part casting
Chemicals sector
• Exploring innovative solutions and development of catalysts to reduce raw material and process-based carbon and water footprint • Pioneering biorefinery technologies • Advancing innovative technologies for the generation of green and blue ammonia and green methanol • Development of green hydrogen production and storage technologies • Mobilization of advanced separation technologies in green chemistry • Development of innovative recycling processes in the rubber sector and development of recovery technologies from domestic resources and wastes
Plastic sector
• Within the scope of recycling, the development of processes and technologies for the collection and recycling of waste, including technologies to support the deposit management system • Implementing advanced technologies and practical solutions to enhance energy efficiency within the plastic production industry • Development of technologies to increase the efficiency of polymer processing machines • Pioneering innovative and green technologies in the production of biobased materials
Cement sector
• Mobilizing technologies for energy solutions for clinker production • Development of technologies for improvements that will minimize the climate impacts of clinker production processes and increase their efficiency • Advancing cost-effective CCUS technologies and their integration into clinker production processes • Improving the production of concrete and cement-bonded materials
Fertilizers sector
• Advancing organic and organomineral fertilizer production technologies

- Improving the nitrogen fertilizer production process in terms of raw materials, catalysts, making it more efficient and developing technologies to reduce nitrogen gas emissions within the scope of mineral fertilizer processes
- Designing circular processes in the sulfuric acid production process to ensure energy resource efficiency and developing technologies to reduce sulfur dioxide emissions
- Development of technologies to increase efficiency and reduce emissions by designing circular processes in the phosphoric acid production process
- Conducting studies for the production of advanced technology fertilizers, including the development of technologies for the economic and ecological production of nanofertilizers
- Promoting new technologies for monitoring and evaluation of soil and plant analysis
- Pioneering biosensor technologies

These targets aim to stimulate R&D and innovation in renewable and clean energy, driving investments in relevant areas. Hydrogen technologies could significantly impact the aforementioned sectors, while CCUS technologies are also expected to gain prominence. However, due to limited storage capacity and high costs, carbon storage technologies may only see widespread use once cost-effectiveness is improved. Additionally, the growing demand for circular economy solutions is likely to boost R&D and innovation in physical, chemical, and biological processing, waste management, and converting waste into value added products, raw materials, and intermediates.

The Climate Change Adaptation Strategy and Action Plan also addresses technological initiatives to enhance the country's ability to adapt the impacts of climate change. The plan involves conducting a technology needs analysis for climate change adaptation, formulating an R&D and innovation strategy with a clear roadmap. Agriculture is identified as a critical sector requiring advanced technological interventions to adapt to the challenges posed by climate change. Türkiye prioritizes increasing R&D efforts to assess climate change impacts on agriculture and develop effective adaptation strategies. This includes creating comprehensive databases, leveraging information technologies, and fostering innovative practices to guide agricultural activities in the face of a changing climate. To address the challenges in the agriculture sector, investments in smart irrigation systems, satellite-based and sensor-based early warning and monitoring technologies, advanced information systems, and integrated agricultural technologies are essential.

Timely access in space-based Earth observations offer "vast opportunities" for the prevention of the future extreme weather events. Immersive technologies such as digital twins, virtual reality and the metaverse would provide better chance for simulating flood and drought events to predicting water flow, and land degradation by enabling to make better informed decisions.

7.5 INFORMATION ON CAPACITY-BUILDING SUPPORT NEEDED

Best practices in capacity-building include, but are not limited to, engaging multiple stakeholders, strengthening ownership by relevant central and local administrations, and sharing experiences and lessons learned, especially at the

regional level. Türkiye's climate strategies for mitigation and adaptation cover a broad range of capacity building actions in various sectors, with an emphasis on the needs for institutional and technical infrastructure, training, and public awareness.

In line with the Updated First NDC, the Climate Change Mitigation Strategy and Action Plan identifies main capacity building steps in the industry, energy, building, agriculture, waste and LULUCF sectors and cross-cutting areas such as just transition and carbon pricing. The plan includes actions to enhance technical and human capabilities across various environmental subsections such as forest damage, erosion, desertification, promoting climate-friendly agriculture practices, and managing wetlands. Capacity building initiatives will be implemented for manufacturing industry stakeholders, especially SMEs, to enhance their understanding of climate change impacts. Additionally, the country focuses on building capacity to mitigate climate change risks, calculate GHG emissions, and support just transition and employment transformation. To illustrate the scale of the needs in this area, annually $620 million is solely required for retraining people for the jobs requiring upskilling because of the green transition according to the World Bank's estimates.239

This Action Plan also emphasizes promoting training and awareness programs for agriculture sector stakeholders and building the capacity of relevant parties on zero-waste practices, water usage, circular economy principles, and GHG emission reduction. Training activities will be conducted to disseminate knowledge about renewable energy systems and energy efficiency in buildings, targeting architects, engineers, and technicians. The goal is to increase the number of trained professionals in carbon management across sectors and implement training programs to meet the labor demands arising from the transformation process. Furthermore, the Action Plan aims to build capacity and infrastructure for the ETS, voluntary carbon market, and national offsetting mechanisms, as well as the implementation of Article 6 of the Paris Agreement.

Moreover, the country is dedicated to supporting private businesses in complying with the EU's CBAM regulations, especially regarding the reporting obligations. Enhancing the capabilities of commercial and industrial associations, exporter groups, development agencies, and organized industrial zones through training initiatives is crucial to achieving this goal.

High-quality data is crucial for countries to make informed decisions on investment in climate action and to monitor their effects, and to strengthen the evidence base to mobilize climate finance. Robust and comparable data is also vital to evaluate and manage climate-related economic risks at the global level. Türkiye needs to improve its institutional capabilities, skills and expertise for fostering the ecosystem for climate finance inflows. This involves implementing

239 Türkiye CCDR, June 2022.

training initiatives focused on sustainability reporting, empowering banks to adopt sustainable practices and climate risk policies, and establishing both institutional and regulatory structures for green taxonomy and circular economy practices. Particularly, ensuring SMEs compliance with green finance standards and guidelines deserves special attention for the capacity building actions. Given their significant role in Turkish economy, where SMEs constitutes 99.7% of the total number of enterprises, they could contribute more to achieving the country's climate goals if provided with targeted and tailored support.

Capacity building plays a pivotal role in enhancing the effectiveness of climate adaptation actions of the country. As a supportive policy document to Türkiye's Updated First NDC, the Climate Change Adaptation Strategy and Action Plan deals with the capacity building needs for enhanced adaptation actions. It covers the following priorities:

- Transitioning from crisis management to risk management and reinforcing legal, institutional, administrative, scientific, human, and financial capabilities.
- Strengthening institutional capabilities to foster knowledge for better decisions, enhance expertise and training, build a knowledge base, and conduct monitoring and R&D on climate change.
- Building institutional capacity and raising awareness in order to achieve inclusive and responsive climate change and disaster resilience.
- Establishing a comprehensive political and legal structure that facilitates the energy sector's adaptation to climate change. This action will encompass both public and private sectors, aiming to enhance institutional capabilities and cooperation through training and awareness initiatives focusing on information and data production and sharing.
- Developing political and legal structures, along with increased data generation, sharing, and institutional capacity building, cooperation, and awareness campaigns to achieve effective water resource management.
- Formulating the policy and legal framework for climate adaptation in the agriculture sector and strengthening institutional capacity, cooperation and awareness of the relevant stakeholders.
- Raising awareness and building capacity in biodiversity, ecosystem services, and nature-based solutions. This includes promoting ecosystem-focused adaptation approaches, facilitating data and information sharing among all involved parties, and enhancing collaboration to achieve these goals.
- Enhancing capabilities and collaboration, and raising awareness about the impacts of climate change on the health sector. For this purpose, establishing dedicated bodies, carrying out studies on climate and health literacy and launching training programs for healthcare professionals are prioritized.

- Increasing the technical knowledge and resources of industrial businesses, especially SMEs, to help them navigate the challenges posed by climate change.
- Providing training and technical assistance to promote sustainable tourism practices in tourism enterprises and destinations.

7.6 INFORMATION ON CAPACITY-BUILDING SUPPORT RECEIVED

Table 43 - Capacity Building Support Received

Title of activity, programme, project or other	**Programme, project desccription**	**Time frame**	**Implementing entity**	**Type of Support**	**Sector**	**Status of Activity**	**Use, impacts and estimated results**
Analytical and Advisory Programs	The goal of the IBRD's analytical and advisory works is to support institutional and technical capacities of the relevant stakeholders in the fields of green finance and fiscal policy, adaptation, energy and transport, and just transition in line with the NDC and Long-Term Strategy.	N/A	MOEUCC, PSB, Ministry of Energy and Natural Resources (MENR), Ministry of Transport and Infrastructure (MoTI), and other relevant public agencies	Cross-cutting	Cross-cutting	Completed	Several reports have been prepared such as Türkiye CCDR, Unlocking Green Finance in Türkiye, Selected Capital Markets Options to Promote Long-Term Finance For Türkiye. These works have supported the country to develop pathways to achieving the net-zero target and building its capacity to undertake similar analysis going forward.
Green taxonomy Phase -1	The project is financially supported (Euro 200k) by the AFD for the preparation of a national green taxonomy in Türkiye.	2023	MoEUCC	Cross-cutting	Cross-cutting	Ongoing	Establishing a national green taxonomy is expected to be instrumental in reaching Türkiye's transition to a low-carbon economy and tracking green investments.
Green taxonomy Phase -2	The project, funded (Euro 400k) by the AFD, aims at supporting the development of reporting standards and guidelines as well	N/A	MoEUCC	Cross-cutting	Cross-cutting	Planned	The outputs of the project will accelerate the preparation of a green taxonomy scheme for Türkiye.

	as to identifying the users.						
Promoting Low Cost Energy Efficient Wooden Buildings in Türkiye	The project funded by the GEF seeks to promote and replicate the use of innovative wood based technologies as low carbon construction materials in at least 6 pilot wooden building projects.	2023-2029	Ministry of Agriculture and Forestry (MoAF)	Mitigation	Energy	Ongoing	Thanks to the project activities, at least 165,715 tonnes of CO2e and indirect emissions of 2,353 tonnes of CO2e is estimated to be reduced.
Improving intermodal transportation	A consultancy was hired in 2022, aiming at fleshing out intermodality opportunities for İstanbul to provide more efficient and climate-friendly transportation options.	N/A	Istanbul Metropolitan Municipality	Mitigation	Transport	Completed	This project supported the efforts to strengthen transport network, promoting low-carbon mobility and interconnectivity.
Technical assistance on water efficiency	The project, the AFD-backed technical assistance, will promote the efficient, rational, and sustainable use of water resources.	N/A	Istanbul Metropolitan Municipality	Adaptation	Water and Sanitation	Ongoing	The project will address the risks associated with water scarcity and stress due to the adverse impacts of climate change.

Technical assistance on biodiversity protection and gender	The objective of the project, supported by the AFD, is to increase the institutional capacity in the field of biodiversity protection and gender.	N/A	Antalya Water and Wastewater Administration (ASAT) of the Antalya Metropolitan Municipality	Adaptation	Cross-cutting	Ongoing	The project will help the municipality to deliver more effective and inclusive biodiversity conservation practices.
Studies on biodiversity protection	In partnership with the AFD, four different studies related to biodiversity protection (protected areas, sustainable water management, sustainable agriculture, sustainable blue economy and marine protection) have been carried out.	N/A	MoEUCC and MoAF	Adaptation	Cross-cutting	Completed	Project has strengthened the institutional capacity with the help of the gap analysis carried out on protected areas, sustainable water management, sustainable agriculture, sustainable blue economy and marine protection.
Pilot e-monitoring for hydroelectric power plants	The project funded by the AFD aims at installing remote monitoring system in one of the Electricity Generation Corporation (EÜAŞ) hydroelectric power plant.	N/A	Electricity Generation Corporation (EÜAŞ)	Mitigation	Energy	Ongoing	This project aims to increase EÜAŞ's engineering capabilities and to mediate the transfer of know how.

Analytical work on the EU's CBAM	In collaboration with the EBRD, an analysis has been conducted for quantifying the economic impacts of CBAM and exploring the climate policy response options.	N/A	MoEUCC	Mitigation	Industry	Completed	An analytical work has been completed on modelling the impacts of EU's CBAM on the Turkish economy and highlighting the possible steps to adapt the new requirements.
Analytical work on industrial decarbonization	The objective of the project, funded by the EBRD, is to identify low carbon roadmaps and investment needs in sectors exposed to EU's CBAM.	N/A	Ministry of Industry and Technology (MoIT)	Mitigation	Industry	Completed	Analytical works have been prepared for the specific low carbon pathways in hard-to-abate sectors including steel, aluminum, cement and fertilizer.
Analytical work on carbon markets	The project, supported by the EBRD, aims to explore existing and future voluntary carbon market projects in the country and assessment of the opportunities and implications of participation in the Paris Agreement Article 6.	N/A	MoEUCC	Mitigation	Cross-cutting	Completed	The project has contributed to Türkiye's efforts in exploration of existing and future voluntary carbon market projects in the country and assessment of the opportunities and implications of participation in the Paris Agreement Article 6.
Analytical work on hydrogen	The project, funded by the EBRD, supports the country in exploring	N/A	Turkish Energy, Nuclear and Mineral Research	Mitigation	Energy		Assessment of potential low carbon hydrogen economy opportunities has been made in the country with a

	opportunities related to hydrogen.		Agency (TENMAK) of the MENR				specific focus on the private sector.
Green cities	In partnership with the EBRD, the project aims to provide strategy and policy support through the preparation of green city action plans to address climate change and environmental challenges.	N/A	Istanbul, Ankara, Gaziantep and Bursa Metropolitan Municipalities	Cross-cutting	Cross-cutting	Ongoing	Green city action plans are being prepared.
German-Turkish Energy Forum	In partnership with Germany, activities have been carried out to exchange of best practices through joint studies, workshops, study trips and pilot projects in the energy sector.	N/A	MENR	Mitigation	Energy		The project supports Türkiye to advance energy transition.
Support for establishment of ETS mechanism	The project, funded by Germany (International Climate Initiative - IKI), aims to enhance capacity of the country for establishing MRV system.	2013-2024	MoEUCC	Mitigation	Cross-cutting	Ongoing	The project is setting up the technical and institutional infrastructure, developing sector-specific MRV guidelines and regulations, and contributing to policy making aimed at establishing an ETS.

Cool Up: Upscaling Sustainable Cooling	The project, funded by Germany (International Climate Initiative - IKI), seeks to create catalytic change in the refrigeration and air conditioning sector.	2020-2027	MoEUCC	Mitigation	Energy	Ongoing	The project will help Türkiye ultimately upscale the deployment of sustainable cooling technologies in the market.
Linking ambitious renewable energy development and efficient sector coupling in the MENA region	The project, funded by Germany (regional IKI project), aims to enable alternatives to fossil fuel pathways and facilitates the achievement of high renewable shares through sector coupling.	2023-2029	MENR	Mitigation	Energy	Ongoing	The project will contribute to accelerate renewable energy deployment while decarbonizing end-use sectors in Türkiye.

7.7 INFORMATION ON SUPPORT NEEDED AND RECEIVED FOR THE IMPLEMENTATION OF ARTICLE 13 OF THE PARIS AGREEMENT AND TRANSPARENCY-RELATED ACTIVITIES, INCLUDING FOR TRANSPARENCY-RELATED CAPACITY-BUILDING

Türkiye emphasizes the importance of Article 13 of the Paris Agreement in tracking progress, fostering trust, and promoting the effective implementation of climate actions. In accordance with its obligations, Türkiye regularly submits its reports, including the National Communications, GHG Inventory, Biennial Reports, and the most recently, the Biennial Transparency Report, to the UNFCCC as part of the global commitment to climate change mitigation and enhanced transparency. Having ratified the Paris Agreement as a developing country, Türkiye is committed to fulfill its reporting obligations under the Enhanced Transparency Framework, aligned with its developing country status. In this regard, the country needs financial and technical support for meeting the reporting obligations under the UNFCCC and the Paris Agreement.

Strengthening policy and institutional frameworks to support climate finance is essential for the country's climate targets. Improvement of the data quality is quite important for countries to make informed decisions on investment in climate action and to monitor their effects, and to strengthen the evidence base to mobilize climate finance. Robust and comparable data is also vital to evaluate and manage climate-related economic risks. There is an increasing need to build capacities to enhance data collection, management and analysis. This includes improving statistical systems, training personnel, and investing in technology to support data reporting and tracking. 12th Development Plan emphasizes accelerated efforts to finance green transformation, particularly in areas such as legislative frameworks, taxonomy, MRV driven by initiatives to create sustainable and green financial products. It anticipates the regular production and sharing of environmental datasets and indicators aligned with international standards, along with the development of monitoring and evaluation systems. Additionally, under the mentioned Plan, a data infrastructure is aimed to be established to enhance the quality and transparency of environmental data reporting, ensuring it is comparable and reliable, in compliance with international conventions to which Türkiye is a party.

Modelling capacity of the line Ministries and public agencies to project economic consequences of climate change at sectoral levels and performing cost-benefit and investment needs assessments for the country's climate objectives outlined in the NDC and associated strategies need to be strengthened. Detailed analytical work is necessary to explore the short-, medium-, and long-term implications of the physical and transitional impacts of climate change on multiple sectors in Türkiye.

A coordinated approach involving improved data, enhanced research, integrated planning, strong institutions, technological innovation, and public engagement is essential for ensuring transparency and accountability. Therefore, the country's capabilities in these domains need to be enhanced to facilitate better-informed decision-making, more targeted reporting the financial, technological and capacity building supports required and received for its climate actions. Standardized and harmonized methodologies for tracking climate finance and establishment of a robust MRV system for this purpose will contribute to Türkiye's efforts to increase effectiveness of climate finance, ultimately accelerating progress towards a net zero emissions future.

Table 44 - transparency support received

Title of activity, programme, project or other	**Objectives and description**	**Time frame**	**Recipient entity**	**Channel**	**Amount (USD)**	**Status of activity**	**Expected use, impacts and estimated results**
Enabling the Republic of Türkiye to Prepare its First Biennial Transparency Report (BTR1) and the Joint Ninth National Communication and Second Biennial Transparency Report (NC9/BTR2) to the UNFCCC	The project aims to assist Türkiye in the preparation and submission of First BTR1 and the NC9/BTR2 to the UNFCCC.	2024-2028	MoEUCC	Multilateral	1,233,000	Ongoing	In line with the Updated First NDC of Türkiye, the project will support the country in mainstreaming and integration of climate change consideration into national and sectoral development policies by giving continuity to the institutional and technical capacity strengthening process.

8 RESEARCH AND SYSTEMATIC OBSERVATION

This chapter provides an overview of Türkiye's national policies, research activities, and research and development (R&D) programs aimed at mitigating and adapting to climate change, as well as systematic observations of Türkiye including the atmosphere, terrestrial and oceanic climate, and cryosphere observations. Additionally, the chapter discusses additional actions to support capacity-building and national and international data sharing efforts.

8.1 GENERAL POLICY ON RESEARCH AND SYSTEMATIC OBSERVATION

Türkiye is among the countries that will mostly be affected from climate change, due to its geographical position, and is therefore contributing to the global efforts in climate change measures. Türkiye announced its "2053 Net Zero Emission Target" on September 27, 2021. By becoming a party to the Paris Agreement and announcing the net zero emission target, which is defined as the flagship target of the green development revolution of Türkiye, the Country has taken an important step towards green and sustainable growth. Türkiye is gearing up to take the necessary actions to transform its society accordingly. Türkiye is pursuing a **science, technology and innovation (STI) policy** aimed at promoting green growth and limiting the rising trend of emissions; as well as making efforts for adaptation to climate change.

There are ongoing studies in Türkiye that aim to gather all relevant actors in the STI ecosystem in Türkiye around a dedicated **"Green Strategic Research Agenda"** that will embrace the targets of the EU Green Deal. The motivation and high-level ownership of the Government for the green transformation of the economy will pave the way for the successful implementation of this Research Agenda. Türkiye's national vision within the scope of climate change is to become a country fully integrating climate change related objectives into its development policies, disseminating energy efficiency, increasing the use of clean and renewable energy resources, actively participating in the efforts to tackle climate change within its special circumstances and providing its citizens with a high quality of life and welfare with low carbon intensity. This action will strengthen Türkiye's STI policy by achieving the mobilization and enhancement of the Green Growth Research and Development Institute (RDI) Ecosystem in Türkiye.

Türkiye has been taking steps for a green economy as part of its fight against the negative impact of climate change and establishing new institutional arrangements for climate change issues, including the MoEUCC and the updating of the National Climate Change Action Plan.

The **"Türkiye's 2023 Industry and Technology Strategy"**, announced in 2019, focuses on the development and commercialization of breakthrough technologies in key industrial sectors that are vital for combating climate change and supporting the transition to the green economy in Türkiye by 2030. This includes alternative fuels, energy storage, energy efficiency, agriculture technologies, biotechnology, artificial intelligence, nanotechnology, 5G and beyond, additive manufacturing, robotics, and autonomy. The strategy also highlights green production and industry policies aimed at reducing the impact of industrial production on the environment and prioritizes new investments in cleaner production and technological modernization of firms. Additionally, the strategy emphasizes the establishment and expansion of an industrial symbiosis ecosystem in Türkiye and the engagement of traditionally separate industries in a collective approach for industrial symbiosis.

The Scientific and Technological Research Council of Türkiye (TUBITAK) took the responsibility for leading "**Science and Technology Commission**" within the context of the Climate Council of Türkiye organized in the beginning of this year. Science and Technology Commission was established to foresee the technologies of the future that are required and will contribute to Türkiye's 2053 net zero emission target and green development policy. Ground-breaking R&D and innovation-based solutions are discussed in specific themes chosen in accordance with the EU Green Deal topics. We aimed to foresee the technologies of the future for adaptation and mitigation to climate change, to enable Türkiye to develop its R&D and innovation capacity in these technologies, and thus to turn the climate change crisis into an opportunity in the medium/long term. With a multidisciplinary holistic approach, we held more than 40 online meetings with the participation of 100 experts from academia, private sector, NGOs and public institutions. We have prioritized 34 technology main topics and 262 sub-topics consisting of targets. The outcomes of this study have been translated into updated prioritized RDI topics for climate change mitigation and adaptation.

The R&D and innovation sub-topics to be focused on within the scope of the above-mentioned 5 theme are given below and details could be reached at the web site of the Council[240].

- Theme1: Climate Change, Environment and Biodiversity
- Theme 2. Clean and Circular Economy
- Theme 3. Clean, Accessible and Secure Energy Supply
- Theme 4. Green and Sustainable Agriculture: A Fairer, Healthier and Environmentally Friendly Food System from Farm to Fork
- Theme 5. Sustainable Smart Transportation

8.1 RESEARCH

8.1.1 Research and Development Innovation (RDI) Supports

There are several research institutions in Türkiye which are actively working on climate research. **TUBITAK** and universities are the key institutions while the MoEUCC, MENR, MoAF, and Ministry of Health have their own strategy and research centers to develop technologies, which will enable Türkiye to reach its climate targets. These ministries and TUBITAK also **provide RDI supports** in their relevant technology areas. Annex II includes a list of research institutions in Türkiye which are active in climate change related research.

Supporting the development of technologies focused on climate change mitigation and adaptation which through research and development (R&D) is upheld as one of the priorities within the mission-oriented support programmes of TUBITAK. In this respect, priorities as put forth in the Climate Change Strategy of the Republic of Türkiye, the Green Deal Action Plan of Türkiye, and other related national strategy documents have the opportunity to be supported through calls that are opened through TUBITAK.

In line with the 2053 zero emission target of Türkiye, studies regarding the future planning are also carried out intensively in order to support the fight against climate change and environmental problems in priority R&D and Innovation issues. Türkiye's main national R&D and Innovation Support Programs involve priorities based on the Green Deal for innovative solutions to contribute to protect

[240] https://iklimsurasi.gov.tr/en

ecosystems from climate change, clean and circular economy, clean, accessible and secure energy supply, green and sustainable smart transport.

Within the scope of the **policies** of the Ministry of Treasury and Finance and the **Green Deal Action Plan** of the Ministry of Trade, it is planned to determine the necessary technologies to both comply with the European Green Deal and increase green production in the industry, to support R&D studies in order to develop the technologies to be determined, and to carry out studies for the dissemination and transfer of technologies.

TUBITAK has been one of the earliest institutions which announced the roadmap for the zero-emission target for the year 2053, which was determined in order to fulfill Türkiye's obligations arising from the Paris Climate Agreement. "**Prioritized R&D and Innovation Topics within the Scope of Green Deal Agreement Compliance"** is published at the beginning of the year 2021. This guidance document for prioritized topics focused on five main themes namely **"Climate Change, Environment and Biodiversity", "Clean and Circular Economy", "Clean, Accessible and Secure Energy Supply", "Green and Sustainable Agriculture", "Sustainable Smart Transportation".** Projects focusing on these topics are being prioritized in the TUBITAK's R&D and Innovation Supports and co-creation models for both knowledge creation and development of human resources are being mobilized by TUBITAK.

Tackling climate change and realizing the "2053 zero emission target" requires university, government and industry actors to collaborate and to join efforts and capabilities. Accordingly, TUBITAK directed its platform-based support tools to the areas of compliance with the European Green Deal for achieving impact and for mobilizing the R&D and innovation accumulation within the scope of co-creation models. In TUBITAK's new call for proposals of the "**High Technology Platforms Support" and "Industry Innovation Networks Mechanism (SAYEM)",** areas focusing on sustainable solutions to mitigate and adapt to climate change attracted significant attention. In the recent calls for TUBITAK "High Technology Platforms Support" and "Industry Innovation Networks Mechanism (SAYEM), high-tech platforms targeting the areas of harmonization with the European Green Deal, including the circular economy topics with a focus on high-tech products and high-tech information-intensive services, are prioritized. The **"Advanced Materials High Technology Platform"**, where advanced material technologies are developed to provide cleaner production opportunities and the **"Turkish Photovoltaic Technologies Platform"**, where highly efficient and cost-effective

solar cell technologies, including new generation solar energy technologies are developed; are examples of platform projects focusing on green technologies.

Within the scope of the **TUBITAK Entrepreneurship Support Program (BIGG)**, TUBITAK has announced a thematic call for Green Deal in September 2021. Over 900 entrepreneurs have applied the call with their business ideas focusing on climate change, environment and biodiversity, and regulation of carbon and greenhouse gas emission. Moreover, since 2014, TUBITAK have also been running the Global Clean Technologies Entrepreneurship Program under the auspices of the Ministry of Industry and Technology and in cooperation with UNIDO. Within the scope of TUBITAK Entrepreneurship Support Program (BIGG), we have provided a total of 476 million TL grant support to 1902 entrepreneurs.

With the country's strong performance under the **Horizon 2020 Framework Program**, actors from our RDI ecosystem have took part in 955 projects and received a total of 297.6 million Euros. Of these 1,360 participants from universities and companies from Türkiye, our researchers have undertaken the task of coordinator in 29 projects. In the Horizon Europe Program, universities, companies, and public institutions from Türkiye took part in 91 projects and were awarded 48.2 million Euros.

On the other hand, in 2021, TUBITAK opened special calls for support on the topics of combating mucilage in the Sea of Marmara, one of the priority issues Türkiye needs. TUBITAK supported 37 projects within the scope of the Mucilage Research Call opened with the guidance of the Marmara Sea Action Plan Science and Technical Board. Considering the teams of researchers involved in these projects; 153 researchers from 31 different institutions/organizations (university/research center/private sector) operating in this field have come together to create domestic and national solutions.

The **General Directorate of Agricultural Researches and Policies (TAGEM)** of the MoAF, with its 49 research institutes throughout Türkiye, implements and coordinates research studies on the impacts of climate change on agriculture, the determination and monitoring of agricultural drought, measuring and monitoring of greenhouse gas emissions from agricultural practices, the prediction and prevention of erosion on agricultural areas and rangelands and the determination of the most appropriate water harvesting techniques as of crops and regions in arid and semi-arid regions.

Within the framework of the policies of the Ministry of Agriculture and Forestry, R&D studies in compliance with European Green Deal are being implemented by the

General Directorate of Agricultural Research and Policies through its research network consisting of 49 research institutes throughout the country. Prediction and modeling of the impacts of climate change on important agricultural products; monitoring and mapping of agricultural drought; measuring and monitoring of greenhouse gas emissions from agricultural practices; determining and modelling of soil organic carbon under different land uses; erosion prediction (wind and water) and prevention on agricultural areas and rangelands; determining the most appropriate water harvesting techniques as of crops and regions in arid and semi-arid regions are among the basic climate change-related R&D studies being implemented by TAGEM. In addition, to minimize the adverse impacts of climate change, TAGEM also implements and coordinates R&D studies on the development of drought-resistant varieties and seed breeding, the creation of appropriate technology and irrigation programs for the optimum use of irrigation water in limited water conditions in dry periods, good climate-friendly agricultural practices and widespread use of microbial fertilizers.

8.1.2 Human Resources Supports

TUBITAK gives a special importance to the field of green agreement in human resources support. Within the scope of the **High School and Secondary School Students Research Projects Competitions**, organized to encourage environmental awareness at an early stage, We support projects in the thematic areas of "Ecological Balance, Renewable Energy, Biodiversity, Water Literacy, Sustainable Development, Natural Heritage and Natural Resources, Agriculture and Livestock Technologies, Healthy Life and Nutrition, Food and Food Projects Supply Security, Natural Disasters and Disaster Management, Intelligent Transportation Systems" .

TUBITAK High School Students Climate Change Research Projects Competition was started in order to raise awareness of our students who are continuing their high school education on Climate Change issues. The competition is organized in five main areas: Environment, Economic Sectors, Weather and Climate, Water Studies, Sustainability and Welfare.

In addition, TUBITAK also started the **TUBITAK Polar Research Projects Competition Program** to encourage studies on polar sciences in Antarctica and Arctic regions. The thematic areas of the competition include "Meteorology, Climate, Atmosphere and Space, Terrestrial Ecosystem, Marine Ecosystem, Marine Pollution". In addition, we organize the **TUBITAK University Students Research Projects Competition** in order to contribute to the National Technology Move and the development of the needed qualified human resources. In this context,

students are supported to develop projects in thematic areas, including many areas that serve green transformation, such as Ecological Balance, Renewable Energy, Biodiversity, and Sustainable Development.

In the new calls to be made within the scope of **TUBITAK University Students Research Projects Support** and **TUBITAK Industry-Oriented University Students Research Projects Support**, we prioritize projects focusing on scientific research and technologies that serve the Sustainable Development Goals, especially climate change. In graduate studies, we provide scholarships in priority fields such as "Energy Efficiency, Solar Energy, Coal Technologies, Wind Energy, Agriculture and Livestock Biotechnology" within the scope of **TUBITAK International Doctorate Scholarship Program**.

TUBITAK provides support to university- industry consortiums composed of 49 academic and 210 private sector organizations who came together to train 1162 PhD candidates in the fields needed by the industry within the context of the **Industrial Doctorate Fellowship Programme**. Among the projects supported are increasing water efficiency, environmental sustainability, sustainable agriculture, local biotechnological fertilizers, biobased adhesives, composite materials in textiles, environmentally friendly materials, clean production practices, energy efficiency in glass production, wastewater recovery, energy management in smart grids, etc. topics are included.

With the **International Fellowship for Outstanding Researchers Programme**, 190 top researchers have been integrated into our RDI ecosystem to work in various institutions and organizations, including R&D or design center of the private sector organizations or firms established within techno parks. In addition, we continue to support 82 qualified researchers, who have carried out pioneering research in Türkiye, with **TUBITAK's National Outstanding Researchers Program**.

In the last 20 years, within the scope of **TUBITAK's scholarship and support programs**, 2,242 projects and 2,352 individuals in the field of green transformation and climate change have been supported with a total of 7.36 billion TL in 2023 constant prices.

- Within the scope of **TUBITAK's support programs for academia and the public sector**, a total of 4.37 billion TL (at 2023 constant prices) was transferred to 1,313 supported projects in the field of green transformation and climate change in the 2002-2023 period.
- Within the scope of **TUBITAK's support programs for industry**, TUBITAK provided 1.53 billion TL (in 2023 constant prices) to 929 projects in the field

of green transformation and climate change in the 2002-2023 October period.

- Within the scope of **TUBITAK's support programs for scientists**, a total of 1.46 billion TL (in 2023 constant prices) was provided to 2,352 people in the field of green transformation and climate change in the period 2002-2023.

8.1.3 Further Planning

The Green Deal Action Plan of Türkiye was released by the Ministry of Trade and provides a strategy for achieving a green transition of the economy. Within the scope of the Action Plan, **"Green Growth Technology Roadmap"** studies are being carried out by the MoIT and TUBITAK. The Technology Roadmap study is being conducted for the Iron-Steel, Aluminum, Cement, Chemicals, Plastics and Fertilizer sectors; which are critically important for the Turkish economy and have high carbon emissions. Because of the Technology Roadmap studies, priority R&D and innovation themes for each sector will be detailed. Benefiting from the outputs of this study, proper STI and investment support programs will be designed in cooperation with MoIT especially for projects that will provide domestic solutions to the technological needs of private sector organizations in Türkiye that will enable them to adapt to green transition. TUBITAK will contribute to the green transformation of the Turkish economy and industry and Türkiye's vision of green and sustainable development, with a focus on science and technology.

8.1.4 RDI Activities

TUBITAK is committed to developing technologies that can help the country face global risks and challenges, turning them into opportunities for innovation. To achieve this, TUBITAK emphasizes co-creation oriented new knowledge generation and human resources development. The concept of **"Twin Transition"** highlights the simultaneous impact of digital and green transformations on all systems, and TUBITAK recognizes the need to strengthen the R&D and innovation ecosystem to drive these transformations. TUBITAK encourages multi-disciplinary and multi-stakeholder solutions, with an approach based on "co-creation" and "succeeding together" to promote impact-oriented solutions.

Digital technologies are a priority in TUBITAK's R&D and innovation support programs. 42% of the prioritized technologies for 2020-2021 are in the field of information and communication technologies. Big data, cloud computing, artificial intelligence, robotics, embedded systems, and the internet of things are just a few examples of digital technologies that can benefit fields such as

biodiversity, ecosystem monitoring and protection, air quality, precision agriculture, sustainable cities, and innovative agricultural systems. TUBITAK recognizes that taking an inter-, multi-, and trans-disciplinary approach to these technologies will accelerate progress towards addressing climate change.

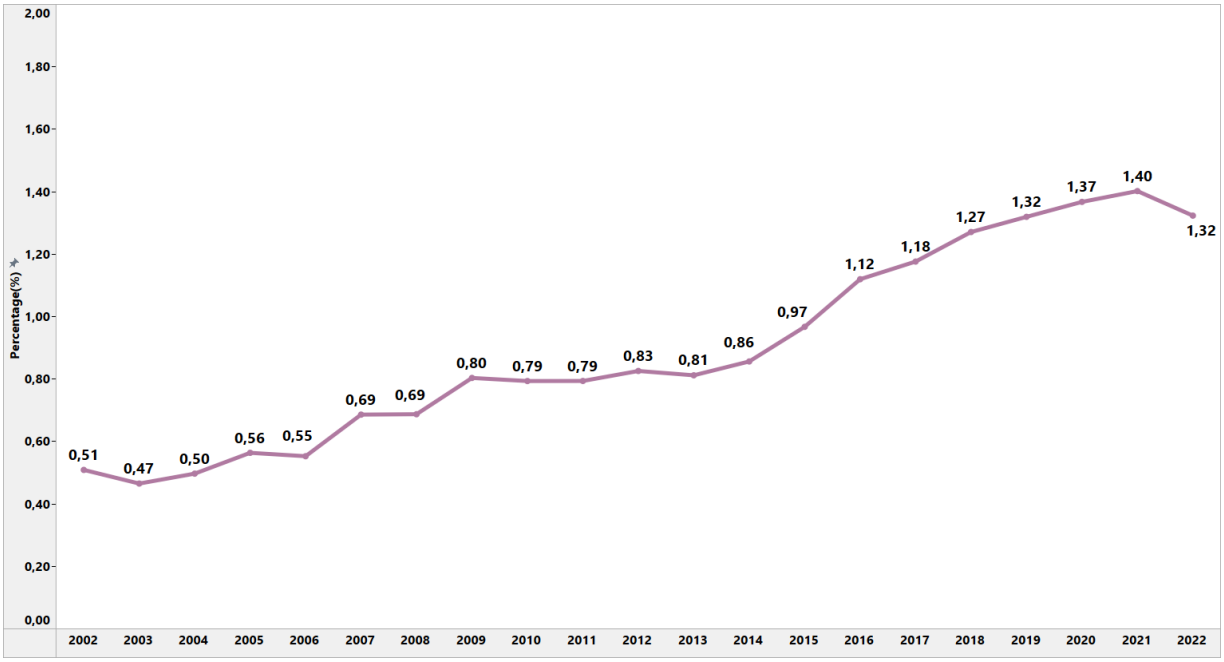
TUBITAK aims to prepare for technological advancements that will foster sustainable development and position the country as a leader in R&D and innovation. The **Science and Technology Commission**'s outcomes are translated into prioritized RDI topics in TUBITAK's R&D and innovation support programs. The **"Prioritized R&D and Innovation Topics within the Scope of Green Deal Agreement Compliance"** has been renewed for academia and industry.

TUBITAK supports private sector organizations by encouraging the commercialization of research results and entrepreneurship processes in the STI ecosystem. **TUBITAK 's Order Based R&D Program** allows technology developer SMEs to collaborate with customer firms and transform their technology-based solutions that meet sector needs into outputs with commercial value. TUBITAK has co-funded 180 projects with customer firms, involving 272 different companies.

According to the statistical data from "Research and Development Activities Survey, 2022" of Turkish Statistical Institute (TURKSTAT) within the scope of the R&D activities as a result of these intensive studies, gross domestic expenditure on R&D (GERD) increased 96 billion 932 million TRY in 2022 compared to the previous year and reached to 198 billion 670 million TRY.

As it is shown in Figure 80, The ratio of Gross Domestic R&D expenditure in gross domestic product (GDP) was 1.32 percent.

Figure 80 Gross domestic expenditure on R&D (as a percentage of GDP, 2002-2022)



TUBITAK Marmara Research Center (MAM) carries out projects that will respond to the critical needs of Türkiye in the most effective and shortest time possible and support the Turkish industry and reduce foreign dependency by transferring the know-how and technologies it has acquired to the private sector. TUBITAK Marmara Research Center was restructured and the "Climate Change and Sustainability Vice Presidency" was established. Several projects carried out by TUBITAK MAM to combat climate change (see Chapter 6.4).

SMART4ENV Project (Enhancing the Scientific Capacity of TUBITAK MAM in the Field of Smart Environmental Technologies for Climate Change Challenges) which runs from 2022 to 2025, aims to improve TUBITAK MAM in the field of smart environmental technologies for climate change challenges. The project seeks to strengthen TUBITAK MAM's scientific reputation, attractiveness, and networking channels while promoting scientific excellence in key applications of smart environmental solutions for the mitigation and adaptation of Türkiye's economy to climate change. The project will achieve this goal by developing capacity building and training programs for permanent scientists and early-stage researchers, fostering cooperation between academia, industry, and stakeholders in Türkiye, and providing a sustainable framework for research, international networking, mobility, and integration in the European Research Area. The project will also strengthen the experience of TUBITAK MAM's research

staff, including a new generation of young scientists, by cooperating with EU partners of established scientific excellence and experience in awareness-raising to contribute to the implementation of environmental sustainability, digitalization, and green deal action plans in Türkiye.

Research infrastructures play an important role in ensuring the necessary R&D and innovation breakthrough for Türkiye's 2053 net zero emission target. Considering the importance of its role in scientific and technological development, since the 2000s, the establishment and development of research infrastructures within universities and public institutions and organizations, in line with national and regional priorities and taking into account the needs of the public and private sectors, has been supported within the scope of investment programs. Some of these infrastructures are; Energy Institute and Environment and Cleaner Production Institute within TÜBİTAK Marmara Research Center, Solar Energy Research and Application Center (GÜNAM) within METU, Ege University Solar Energy Institute, Synthetic Natural Gas and Hydrogen Production Technologies Laboratory within Boğaziçi University, Synthetic Fuels and Chemicals Technology Centre within Istanbul Technical University.

All these studies and efforts were paid in order to find the technological issues where the most accurate and fastest results can be obtained for meeting the objectives set by Paris Agreement. Anticipating the technologies of the future in line with the net zero target will enable Türkiye to develop its R&D and innovation capacity in these technologies. In this way, it is aimed that Türkiye will turn the climate change crisis into an opportunity in the medium/long term.

8.2 SYSTEMATIC OBSERVATION

There are various types of systematic observation systems in Türkiye, including atmospheric climate observation, terrestrial climate observation, ocean climate observation, and cryosphere observation.

8.1.1 Atmospheric and Terrestrial Climate Observing Systems

The **Turkish State Meteorological Service (TSMS)** is one of the leading institutions in the use of modern and advance technology for atmospheric and terrestrial climate observing systems. The TSMS has access to a range of state-of-the-art technologies such as meteorological radars, automatic meteorology observation stations, upper atmosphere observation systems, lightning detection and tracking systems, meteorological satellites, satellite communication and ground receiving

systems, and high-performance supercomputers. Meteorological studies require a robust communication infrastructure on both the national and global scale, and TSMS plays a crucial role in this by collecting, producing and distributing meteorological observation and measurement data in accordance with its national and international responsibilities through its strong communication infrastructure. With the widespread use of state-of-the-art observation systems across the country, it is possible to make automatic observations with electronic devices, thus obtaining faster, more accurate, continuous and timely observation data. [241]

The TSMS is the sole authority for conducting atmospheric measurements in Türkiye. The organization of the TSMS is widespread and covers the entire country, with 16 regional directorates, as shown in Figure 81. The observation network connected to these regional directorates is presented in Table 45.

Figure 81 - Distribution of the TSMS's regional directorates

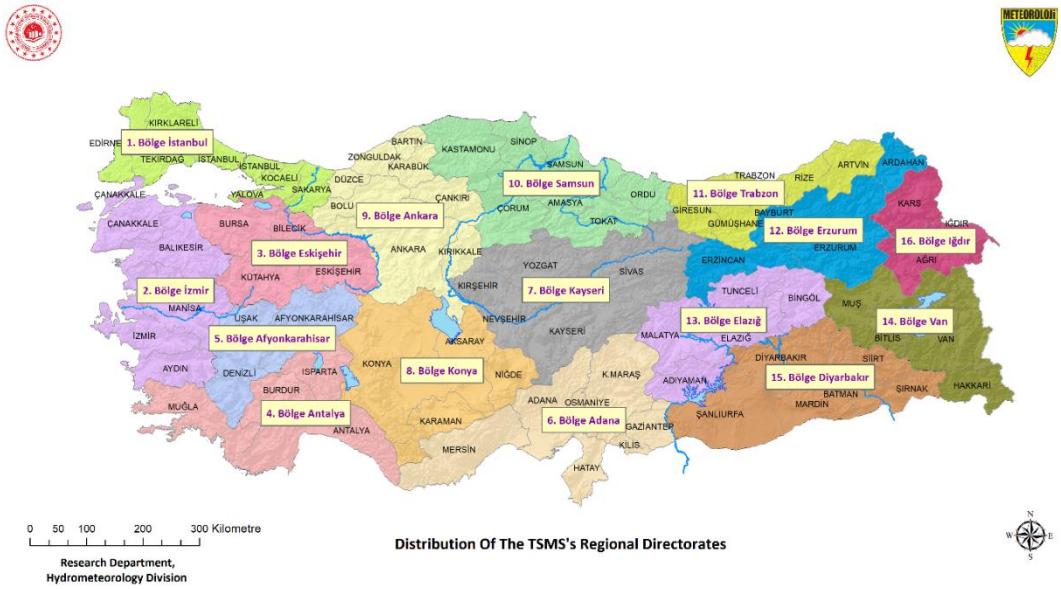


Table 45 - Types of stations connected to the regional directorates

Directorate	AWOS	A-AWOS	Mobil-AWOS	M-AWOS	RADAR	Mobil RADAR	Marine RADAR	Rawinsonde	Mobil Rawinsonde	Lightning Detection	Handheld AWS	LLWAS	Sand and Dust Storm Observation

[241] Turkish State Meteorological Service (TSMS), 2018 Performance Program

Region 1 İstanbul	136	6		13	1		2	1		2	8		
Region 2 İzmir	147	12		28	2			1		3	13		
Region 3 Eskişehir	91	6	1	1	1					2	7		
Region 4 Antalya	134	6		13	2			1		5	7	1	1
Region 5 Afyonkarahisar	95	3			1					2	4		
Region 6 Adana	131	4		8	2	1		1		4	5		
Region 7 Kayseri	116	3			1			1		2	4		
Region 8 Konya	92	1			1					2	2		
Region 9 Ankara	147	5		4	2			1	1	3	18		1
Region 10 Samsun	166	6		11	1			1		3	7		
Region 11 Trabzon	134	2		8	1					1	2		
Region 12 Erzurum	70	2			1			1		2	3		
Region 13 Elazığ	94	5								1	6		
Region 14 Van	48	3		4						3	4		
Region 15 Diyarbakır	87	7			1			1		4	7		1
Region 16 Iğdır	29	3								2	3		

Total	**1,717**	**74**	**1**	**90**	**17**	**1**	**2**	**9**	**1**	**41**	**100**	**1**	**3**

The TSMS cooperates with the World Meteorological Organization (WMO), of which it is a member. Through this international partnership, the TSMS is actively participates in all WMO programs, including the Global Observing System (GOS), the Global Climate Observing System (GCOS), Surface Radiation Network (SRN) and Global Atmospheric Watch (GAW). The GOS combines various international data collection systems, such as Global Upper Atmosphere Observing Systems, Global Climate Observing Systems, etc. on the national scale. The TSMS shares internationally, on behalf of Türkiye, airport observations (75 stations), upper atmosphere observations (9 stations), climatic observations (GCOS 7 stations and Regional Basic Climate Network 61 stations), synoptic observations (Regional Basic Synoptic Network 278 stations) and ozone observations (GAW 1 station) through a total of 308 stations (WMO WIGOS OSCAR).

The GCOS consists of surface network and upper atmosphere network and stations in GCOS are similar to those in GOS. Stations from Türkiye (Rize, Istanbul, Kastamonu, Sivas, Isparta, Finike) are GCOS stations.

8.2.1.1 Meteorological Observation Network

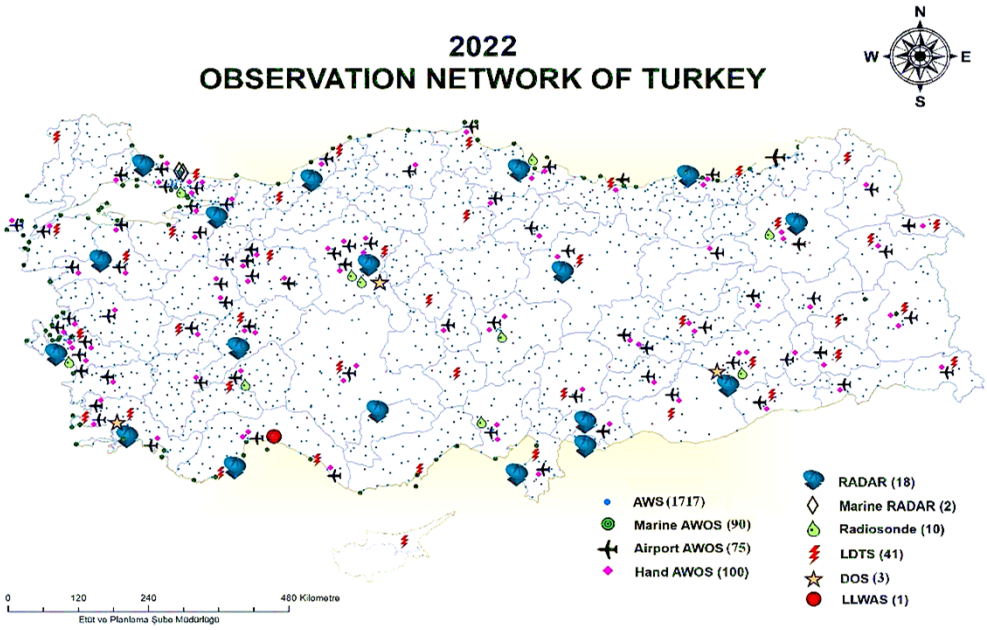
In Türkiye, the observation network has been continuously expanding and modernizing since the implementation of planned observation in 1929. Today, the observation network consists of a wide range of systems that provide real-time weather information to the user, support forecasting, increase the consistency of forecasts, and facilitate research activities including climate and climate change. This observation network by TSMS in Türkiye is shown in Figure 82 and includes:

- Automatic Weather Observation Stations (AWOS)
- Airport Automatic Weather Observation Stations (A-AWOS)
- Handheld Automatic Weather Stations (HAWS)
- Meteorological Satellite Ground Receiver Systems
- Meteorological Radar Systems
- Lightning Detection and Tracking System (LDTS)
- Upper Atmosphere Observation Systems (Rawinsonde)
- Sand and Dust Observation Systems (DOS)
- Low-Level Wind Shear Alert System (LLWAS)
- Solar Radiation Observations

- Marine Automatic Weather Observation Stations (M-AWOS)
- Marine Radars

At the end of 2022, the number of systems in the observation network has reached 2,057 as shown in the Figure 82. These systems are managed and operated by the TSMS and are used to prepare meteorological products and services needed by various sectors.

Figure 82 - Observation Network by TSMS in Türkiye



TSMS operates a wide range of weather observation and monitoring systems in order to collect data on various meteorological parameters. In addition to ***"Automatic Weather Observation Station (AWOS)"***, TSMS operates ***"Airport Automatic Weather Observation Station (A-AWOS)"*** which are designed to prepare meteorological products and services that are essential for aviation at airports and flight safety. As of the first half of 2022, the number of observation stations has increased in the last 5 years and reached 75 airports across Türkiye, where data is collected from the 74 A-AWOS stations and 1 Mobile AWOS.

TSMS also uses ***"Handheld Automatic Weather Stations (HAWS)"*** as part of its weather observation and monitoring network. These HAWS provide an additional level of redundancy to existing systems by providing weather observations in case of the failure of the other systems, which are installed at the Regional Directorates and airports of TSMS. As of 2022, 100 HAWS have been put into service. They can

also be used in the Meteorology Observation and Forecasting Centers (TIR) to supplement the data from the other systems.

"Meteorological Satellite Ground Receiver Systems" are an important component of the weather observation and monitoring network operated by TSMS. In 1984, TSMS joined the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) as a founding member. As of 2022, TSMS is receiving real-time and near real-time data from 3 EUMETSAT geostationary orbit satellites and 2 polar orbit satellites.

"Meteorological Radar Systems" are remote sensing systems that use radar waves to determine the density, position, direction, and speed of air masses in the atmosphere. These systems can provide a high resolution, large-scale view of weather conditions which makes them an important tool for meteorological research and short-term weather forecasting. As of 2022, TSMS operates a meteorological radar network consisting of a total of 18 radars (17 C-Band radars and 1 X-Band radar). The C-band radars are located in Ankara, Istanbul, Balıkesir, Zonguldak, Izmir, Muğla, Antalya, Hatay, Samsun, Trabzon, Afyonkarahisar, Bursa, Karaman, Gaziantep, Şanlıurfa Erzurum and Sivas. The X-Band radar is at Istanbul Atatürk Airport .[242]

The ***"Lightning Detection and Tracking System (LDTS)"*** is used for detecting, tracking lightning and thunderbolt phenomena, as well as for short-term weather forecasting, known as Nowcasting. This system uses a network of sensors to detect and locate lightning strikes, and can provide information on the location, type, polarity and signal size of lightning and thunderbolt, as well as the height of lightning. As of 2022, TSMS is using the LDTS installed at 41 points across Türkiye.

"Upper Atmosphere Observation Systems" such as rawinsondes, are used to obtain height data of temperature, humidity, wind and pressure levels in the atmosphere up to 35 km above ground level. These systems provide the upper atmosphere data required for presenting meteorological products and services, which are of vital importance for weather forecasting and flight safety. As the first half of the 2022, upper atmosphere observations are performed at 9 stations across Türkiye, these stations are Adana, Ankara, Diyarbakır, Erzurum, Isparta, Istanbul, Izmir, Samsun and Kayseri. Furthermore, 1 mobile system can be used to conduct upper atmosphere observations in any location .[243]

[242] Turkish State Meteorological Service (TSMS). 2022 Administrative Activity Report

[243] Turkish State Meteorological Service (TSMS). 2022 Administrative Activity Report

Sand and dust storms can have a significant impact on air quality, visibility and public health as well as on transportation and other human activities. The area extending from the Western Sahara through the Middle East and Central Asia to the Gobi Desert is often referred to as the "dust belt" due to high frequency of dust storms that occur in this region. Türkiye is situated near the Middle East, with territory in both Europe and Asia, thus making it vulnerable to dust storms from both North Africa and the Middle East. To better monitor the transboundary transport of dust, TSMS has been increasing its capacity in monitoring sand and dust storms. As of 2022, TSMS has installed 3 ***"Dust Observation Systems (DOS)"*** in strategic locations across the country.

A ***"Low-Level Wind Shear Alert System (LLWAS)"*** is a ground-based system that is used to detect wind shear and other associated weather phenomena, such as microbursts, close to an airport; particularly along the runway corridors. LLWAS has been installed in Antalya Airport in 2018, and continuously providing wind shear alerts.

"Air Quality Observation Systems" are used to monitor the concentration of various pollutants in the air, such as particulate matter, ozone, nitrogen oxides, sulfur dioxide, and carbon monoxide to understand the impacts of air pollution on human health and the environment. The samples coming from the Automatic Precipitation Collecting Systems located in 10 different regions of Türkiye are analyzed in the Acid Rain Laboratory in terms of acidity (pH), electrical conductivity, and metal analyses, anion and cation analyses are conducted, and transboundary pollution transportation is detected. As of 2022 in Türkiye, 365 air quality measuring stations have been established by various institutions, such as the Ministry of Environment, Urbanization and Climate Change (MoEUCC), municipalities, and Organized Industrial Zones. These stations measure parameters such as sulphur dioxide (SO_2) and particulate matter (PM10) parameters, nitrous oxides (NO, NO_2, NO_x), carbon monoxides (CO) and Ozone (O_3). All data is sent to and collected by the Data Operation Center of Environmental Reference Laboratory affiliated to the MoEUCC.

Ozone monitoring is an important aspect of meteorological observations, as ozone is a key component of the Earth's atmosphere and plays and important role in protecting life from the harmful effects of ultraviolet radiation from the sun. TSMS operates an ***"Ozone Monitoring Network"*** that uses "Brewer Spectrophotometer Device" to measure total ozone. Measurements are taken

regularly and sent to the World Ozone and Ultraviolet Radiation Data Centre (WOUDC) and the results are also published.

8.2.1.2 Hydrometeorological Observation Network

In order to reveal the water resources potential of Türkiye, it is mandatory to make observations, evaluate them, publish them and make them available to all users. Observation activities in our country are carried out by the **General Directorate of State Hydraulic Works (DSI)** as a result of the closure of the General Directorate of Electrical Power Resources Survey and Development Administration with the Decree Law No. 662 in November 2011. In Türkiye, observation activities include;

- Irrigation Water
- Industrial water supply
- Drinking Water and Water Quality Monitoring
- Flood control structures
- Energy / Private Sector Energy

In the planning and operation stages of dams or ponds for optimum planning and rational management of water resources, accurate and reliable water measurements are needed in terms of both quality and quantity.

The number of active stations in a hydrometeorological observation network as of 2024 is given in Table 46.

Table 46 - Types and number of observation stations installed by State Hydraulic Works[39]

Type of Station	Number of Station	Number of On-line Station
Flow Monitoring Station	1,340	991
Lake Monitoring Station (Dam + Lake)	531 (435+96)	56
Meteorological Monitoring Station	56	0
Snow Observation Station	260	46
Flood Early Warning	319	319
HEPP Environmental Flow Monitoring	671	619
Miscellaneous Monitoring Stations*	1,382	

Irrigation Canal Monitoring Station	1,577	
Underground Water Monitoring Stations	2,812	
TOTAL	**8930**	**2031**

* Miscellaneous Monitoring stations are temporary monitoring stations usually used in planning studies of ponds (sampling two times in a month)

According to Article 121, clause (r) of the Presidential Circular No. 4, the duty of monitoring surface waters in terms of quality is under the responsibility of the DSI General Directorate, and water quality monitoring studies are carried out by the DSI General Directorate in 25 basins. The spatial numbers of the monitoring points and their distribution in the basins are given in Table 47. The 1672 monitoring points (1348 general purpose monitoring + 324 drinking water monitoring) determined in the 2024 monitoring program were determined by the Regional Directorates entirely for DSI needs (irrigation, drinking water). The parameters were determined as parameters that can be measured by DSI Laboratories for DSI needs.

Table 47 - Water Quality Monitoring Points of 2019-2021

Basin Name	**Monitoring Station Numbers**
Büyük Menderes	130
Susurluk	122
Meriç-Ergene	41
Konya Kapalı	34
Sakarya	125
Akarçay	10
Yeşilırmak	131
Batı Karadeniz	65
Batı Akdeniz	41
Doğu Akdeniz	48

Asi	17
Ceyhan	49
Seyhan	35
Marmara	152
Kuzey Ege	68
Küçük Menderes	66
Gediz	112
Burdur	4
Antalya	41
Kızılırmak	105
Doğu Karadeniz	65
Aras	53
Çoruh	17
Van Gölü	25
Fırat-Dicle	119
TOTAL	**1672**

As 25% of Türkiye's power generation comes from hydraulic sources, it is vital to have accurate predictions of water flow and efficient operation of hydroelectric power plants. Inadequate predictions of water flow inefficient operation can lead to significant financial losses and problems like overflowing dams and floods. To address these issues, the **"Flow Estimation and Basin Optimization Model Project (ATHOM)"** was conducted between DSI and TUBITAK Marmara Research Center in the Seyhan Pilot Basin. The aim of the project is to develop a model that can accurately estimate the water flow in existing and single and sequential water structures, and accordingly the prepare water budgets and optimize the daily, monthly and annual operation of the facilities.

The ATHOM system was successfully developed and implemented in the Seyhan Basin, and it was decided to extend the system to the Euphrates-Tigris, Kızılırmak, Yeşilırmak and Ceyhan Basins, which include the largest river basins of Türkiye. As of June 2020, a new project was signed to further extend the use of ATHOM system for new basins under the name of the "ATHOM Development and Expansion Project". This new project includes the preparation of data infrastructures for new basins and completion of an operational data network. The studies for the development of new estimation and optimization models continue according to the updated literature, with the goal of including all basins of the country in the ATHOM system, and thus enabling all the basins of the country to be managed by a single system, with widespread use of the ATHOM system. The specifications and contract for the expansion of the ATHOM system to all basins in Türkiye have been signed to start in May 2024.

8.2.1.3 Early Warning and Forecasting Systems in Türkiye

As outlined in the 8th NC, the Turkish State Meteorological Service (TSMS) plays a crucial role in managing climate-related risks through a comprehensive range of early warning and forecasting systems. These systems, backed by TSMS's membership in international meteorological organizations like the World Meteorological Organization (WMO) and access to advanced global models such as ECMWF IFS, ECMWF EPS, and ARPEGE, enable Türkiye to stay ahead of extreme weather events.

Key systems operated by TSMS include the **Flash Flood Guidance System (FFGS)**, which provides warnings up to six hours in advance at the sub-basin scale, and the **Agricultural Frost Warning System (AFWS)**, offering daily frost risk maps for agriculture. The **Drought Monitoring System (DMS)** tracks drought severity using the Standardized Precipitation Index (SPI) and Percent of Normal Index (PNI) methods. The **Meteorological Early Warning System for Forest Fires (MEUS)** identifies high-risk areas for fires using meteorological data, contributing to early detection and prevention.

TSMS also operates an avalanche forecasting model, **inversion forecasts** for air pollution risk, and systems for **sand and dust storm predictions.** Additionally, specialized forecasting tools such as the **UV Index and Ozone Forecast Global Model**, **Solar Radiation Distribution Maps,** and systems for **highway** and **seaway** forecasting provide essential data for public safety and planning. The **Marina Forecasting System**, specifically designed for yachting and coastal activities, promotes safer marine tourism.

By leveraging advanced technologies and providing sector-specific early warnings, TSMS supports timely decision-making across various sectors, helping to mitigate the impacts of climate change and extreme weather events in Türkiye.

8.2.1.4 Effective Communication of Meteorological Forecasts and Warnings

As highlighted in the 8th NC, the Turkish State Meteorological Service (TSMS) effectively communicates meteorological forecasts and warnings to the public through various channels, including SMS, email, media outlets, and national television and **radio broadcasts.** The TSMS provides short, medium, and long-term weather forecasts, achieving high consistency rates, with long-term precipitation forecasts reaching 92.4% accuracy in 2021. This ensures timely and reliable information to help mitigate the impacts of extreme weather events.

8.2.1.5 Meteorological Data Management: Observation, Archiving and Distribution

The Turkish State Meteorological Service (TSMS) collects, archives, and distributes meteorological data through a vast network of observation stations, automated systems, and satellites. This data is quickly transmitted to both domestic and international sources and is archived electronically. The **Meteorological Data Information Presentation and Sales System (MEVBİS)** system provides online access to various types of meteorological data, allowing users to retrieve ground, marine, and upper atmosphere observations, as well as climate projections and analysis. [244]

8.2.1.6 Calibration Center (KALMER)

As mentioned in the 8th NC, the Turkish State Meteorological Service (TSMS) Calibration Center has provided calibration services for various meteorological sensors since 2009. Accredited by the Turkish Accreditation Agency (TURKAK) in 2010, and renewed in 2018, the center ensures the global reliability of its measurements in accordance with ISO/IEC 17025:2017 standards. The TSMS Calibration Center also serves as the Economic Cooperation Organization Meteorological Calibration Center (ECO-MCC) and is recognized as a Regional Instrument Center (RIC) for WMO Regional Association VI.

8.1.2 Ocean Climate Observing Systems

As mentioned in the 8th NC, the Turkish State Meteorological Service (TSMS), the General Command of Mapping, and the Middle East Technical University Institute of Marine Sciences (METU-IMS) are key players in ocean climate observation. The

[244] Turkish State Meteorological Service (TSMS) 2018 Performance Program

METU-IMS leads the DEKOSIM Project to enhance long-term marine observation in Turkish seas, deploying Argo floats and coastal mooring systems. TSMS operates **Marine Automatic Weather Observation Stations (M-AWOS)** and marine radars, providing essential data for maritime activities. The General Command of Mapping manages the **Turkish National Sea Level Monitoring Network (TUDES),** which monitors sea levels with automatic mareograph stations along Turkish coasts.

8.1.3 Cryosphere Observations

As mentioned in the 8th NC, Türkiye has a long history of scientific research in Antarctica, with Turkish Antarctic expeditions beginning in 2016, following the establishment of the Istanbul Technical University's Polar Research Center (PolReC) in 2014. Türkiye became a party to the Antarctic Treaty's Environmental Protocol in 2017, with the General Directorate of Environmental Management acting as the Focal Point. In 2019, the Turkish State Meteorological Service (TSMS) installed an Automatic Meteorology Observation Station (AWOS) on Horseshoe Island, collecting valuable data to support climate change research.

8.2 OTHER ACTIONS TAKEN TO SUPPORT RELATED CAPACITY- BUILDING IN DEVELOPING COUNTRIES

8.2.1 International Cooperation by the Turkish State Meteorological Service

The Turkish State Meteorological Service (TSMS) has developed several key tools and systems to support its research and services in the field of climate and climate change. The **"Meteorological Communication and Applications Package (METCAPPLUS)"** is a software package that facilitates communication between different forecasting centers and the preparation of various meteorological cards, maps, and graphs. It is also used in other countries such as Azerbaijan, Yemen, Georgia and the Turkish Republic of Northern Cyprus. Additionally, TSMS has developed the ***"Flash Flood Guidance System (FFGS) Model"*** which is being implemented in cooperation with international organizations like WMO, NOAA and HRC in Bosnia and Herzegovina, Romania, Serbia, Croatia, Montenegro, Moldova, Slovenia, Macedonia, and Albania were determined as the countries that would participate in the initial phase of the Southeast European Countries Guidance Project. Furthermore, TSMS serves as the ***"Eastern Mediterranean Climate Center (EMCC)"*** under the Regional Climate Center (RCC) in the WMO network, providing monthly climate monitoring, seasonal forecasting and data

products for Greece, Türkiye, Syria, Lebanon, Jordan, Israel, Palestine, Egypt, Southern Cyprus and the Turkish Republic of Northern Cyprus that are located in the Eastern Mediterranean region.

In 2000, Türkiye was recognized as the ***"Regional Training Center (RTC)"*** of the World Meteorological Organization (WMO). The main functions of the RTC include organization of training, seminars, and conferences regarding the meteorology and related fields at the national and international levels. The TSMS currently operates three RTC in Ankara, Istanbul, and Alanya. As of 2022, the TSMS has trained over 1900 international participants from more than 150 countries through various training events. Due to the Covid-19 pandemic, the trainings were held online until these pandemic conditions improved. Now with the development of conditions, it is planned to organize the trainings in a hybrid format. The WMO RTC Türkiye organizes and hosts courses and training programs in various subjects of meteorology and related fields, including AWOS, Upper Air Observation Systems, Calibration, Radar and Satellite Meteorology, Aviation and Satellite Meteorology, Agricultural Meteorology, Climate Applications and Climate Change, Weather Forecasting, and Numerical Weather Forecasting.

8.2.2 International Cooperation by the General Directorate of Combating Desertification and Erosion

The General Directorate of Combating Desertification and Erosion (ÇEM) in Türkiye has been actively involved in international cooperation efforts to combat desertification and land degradation. One such initiative is the "Ankara Initiative" which was launched during the United Nations Convention to Combat Desertification 12th Conference of Parties (COP 12). The initiative aims to contribute to the implementation of the Convention and COP 12 decisions by committing to contribute $5 million to the UNCCD Secretariat for the four-year period from 2016-2019. The Ankara Initiative primarily supports African countries in the national LDN target setting process, including the definition of national baselines, measures and targets to achieve LDN by 2030. The LDN TSP is closely linked to the implementation of SDG target 15.3 at the global and national levels. Under the LDN TSP, African countries have received support through the Ankara Initiative to formulate voluntary LDN targets and measures and to produce a final report that helped secure high-level commitment from the respective national authorities. In the context of Land Degradation Target Programme of the Ankara Initiative, training and workshops were organized for African countries. Türkiye contributed to the 3S (Sustainability, Security and Stability) initiative, which was launched to reverse migration caused by land degradation in Africa and to the

Africa Drought Conference which was held for increasing resilience against the effects of drought in Africa. Other activities under the initiative includes like migration, land tenure, gender mainstreaming, media cooperation, Workshop on International Sand and Dust Storm, Drought Early Warning System Pilot Project in Colombia, LDN Target Setting Workshop for Africa, Central and Eastern Europe, Central Asia Countries, and also Training activities for Central and Eastern Europe and Central Asia, Pan African Agency Countries. The Ankara Initiative was closed in 2023, having fully completed its activities.

The "Boosting Restoration, Income, Development, Generating Ecosystem Services (BRIDGES) Project" is a first project initiated under the FAO-Türkiye Forestry Partnership programme (FTFP) called "Building Bridges Between Türkiye and Africa's Great Green Wall". The project aims to support restoration activities, development of non-wood forest products, establish monitoring systems, improve information management, raise awareness, communication and visibility in three African countries (Eritrea, Mauritania and Sudan) last for three years. The BRIDGES Project also contributed to the Great Green Wall initiative, which is Africa's flagship programme, to bring prosperity and boost resilience in the drylands of over 20 countries around the Sahara by responding to the challenges of deforestation, desertification, biodiversity loss, climate change and food insecurity. The project was completed in 2023.

8.3 NATIONAL AND INTERNATIONAL DATA SHARING

The rapid advancements in technology and globalization have widened the gap between Türkiye and other developed countries. To bridge this gap, Türkiye has implemented the e-Government model which aims to increase transparency, efficiency, and citizen participation in government management using information and communication technologies. The e-Government Portal is a website that provides access to all public services in an efficient and effective way. To support this goal, institutions and organizations are also taking measures to remove obstacles to data access and usage.

As mentioned in ***the Systematic Observation Chapter,*** the TSMS is responsible for preparing and presenting meteorological forecasts for Türkiye. They provide hourly forecasts for all provincial centers, daily forecasts (in 6-hour periods) and 5-day forecasts for all provincial and district centers, and weekly forecasts by region. These forecasts include information on weather conditions, temperature (highest and lowest), humidity, apparent temperature, and wind direction and speed. In addition, 3-day weather forecast data is prepared and published for

some foreign centers. The TSMS also offers a variety of meteorological forecast services through the internet, including long-term forecasts (monthly and seasonal), wave forecast (daily, three-day, five-day), 24-hour wind forecast, as well as numerical forecast model products, stadium and Istanbul Park Forecast.

The TSMS also provides support to a wide range of sectors, including aviation, maritime, and agricultural sectors. Specialized meteorological products have been developed for these sectors based on their specific needs, and new products are constantly being developed to meet new requirements. Some of the meteorological products provided by TSMS for these sectors include:

- **For the aviation sector:** Observations for Aviation (METAR - SPECI), Forecasts for Aviation (TREND - TAF-GAMET), Warnings for Aviation (SIGMET - AIRMET), Hezarfen, Helimet Cappadocia aviation web pages.
- **For the maritime sector:** METU-3 wave forecast model products, SWAN METU-3 wave forecast model products, HF Marine Radar Products, Marine forecast reports, Display of Automatic Marine Observation Stations, Seaway forecasting system, Marina forecasting system, Display of sea water temperatures, Display of Buoy Observations.
- **For the highway sector:** Highway weather forecasting system.
- **For the agriculture sector:** Agricultural Forecast Report, Agricultural Frost Warning System (ZDUS), Agricultural Frost Risk Estimation Maps, Harvest Time Estimation Program, Monthly Bulletin of Agricultural Meteorology, Reference Total Evaporation Maps (ET0), Phenology Maps, Maps of Plants' Resistance to Hot and Cold, Appropriate sowing time map according to soil temperature values.

All domestic and foreign-sourced meteorological data (observations, forecasts, etc.) prepared by the TSMS are collected and managed by the ***"Meteorological Communication and Distribution System (MSS)"*** which then redistributes them to the centers, as well as to the public. The MSS uses advanced technology such as telecommunication networks and computers to support its functions efficiently and effectively. In 2012, the system was updated to increase its capacity and capabilities, and in 2013, further hardware updates were made and WMO Information System- Data Collection and Production Center (WIS-DCPC) hardware and software were added to the MSS system to work in parallel.

The **General Directorate of Geographic Information System** established a national spatial information infrastructure called the **ATLAS Application**. The aim of this application is to facilitate geographic data sharing through a technical infrastructure that enables querying metadata via the national spatial data

portal. Legislation preparation and data sharing standards have also been studied as part of the national geographic information infrastructure works. The ATLAS Application enables the web-based presentation of a variety of geographic data, including administrative boundaries, population density, transportation, hydrography, environmental planning, geology, and true orthophotos. These data, which are produced by all public institutions, local administrations, private sector, and universities, are integrated with the Türkiye National Geographic Information System (TUCBS) and can be viewed layer by layer based on the permissions granted by the data owner institutions. The ATLAS Application can be accessed at https://www.atlas.gov.tr.

9 REFERENCES

1st NDC of Türkiye, 2022. Republic of Türkiye. https://unfccc.int/documents/497990

Updated 1st NDC of Türkiye, 2023. Republic of Türkiye. https://unfccc.int/documents/627743

1st NC of Türkiye, 2007. Republic of Türkiye, Ministry of Environment and Urbanization (MoEU), Seventh National Communication of Türkiye under the UNFCCC. https://unfccc.int/documents/198773

5th NC of Türkiye, 2013. Republic of Türkiye, Ministry of Environment and Urbanization (MoEU), Seventh National Communication of Türkiye under the UNFCCC. https://unfccc.int/documents/199141

6th NC of Türkiye, 2016. Republic of Türkiye, Ministry of Environment and Urbanization (MoEU), Seventh National Communication of Türkiye under the UNFCCC. https://unfccc.int/documents/198420

7th NC of Türkiye, 2019. Republic of Türkiye, Ministry of Environment and Urbanization (MoEU), Seventh National Communication of Türkiye under the UNFCCC. https://unfccc.int/documents/199646

8th NC of Türkiye, 2023. Republic of Türkiye, Ministry of Environment and Urbanization (MoEU), Eighth National Communication of Türkiye under the UNFCCC. https://unfccc.int/documents/638342

11th Development Plan, 2019. Presidency of the Republic of Türkiye, Presidency of Strategy and Budget, 2019. https://www.sbb.gov.tr/wp-content/uploads/2022/07/Eleventh_Development_Plan_2019-2023.pdf

12th Development Plan, 2023. Presidency of the Republic of Türkiye, Presidency of Strategy and Budget, 2023. https://www.sbb.gov.tr/wp-content/uploads/2024/06/Twelfth-Development-Plan_2024-2028.pdf

CRF, 2024. TurkStat, Türkiye, 2024 Common Reporting Format (CRF) Table. https://unfccc.int/documents/461898

DOCC, 2024_a. Climate Change Mitigation Strategy and Action Plan 2024-2030 (CCMSAP), Republic of Türkiye, Directorate of Climate Change (DOCC), 2024. https://iklim.gov.tr/db/turkce/icerikler/files/CLIMATE%20CHANGE%20MITIGATION%20STRATEGY%20AND%20ACTION%20PLAN%20_EN(1).pdf

DOCC, 2024_b. Climate Change Adaptation Strategy and Action Plan 2024-2030 (CCASAP), Republic of Türkiye, Directorate of Climate Change (DOCC), 2024. https://iklim.gov.tr/db/english/icerikler/files/İklim%20Değişikliğine%20Uyum%20Stratejisi%20ve%20Eylem%20Plan_%202024-2030.pdf

INDC of Türkiye, 2015. Republic of Türkiye, Ministry of Environment and Urbanization (MoEU), Intended Nationally Determined Contribution. https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Turkey/1/The_INDC_of_TURKEY_v.15.19.30.pdf

Ministry of Health, 2022. Republic of Türkiye, Ministry of Health, Health Statistics Annual 2020.

Ministry of Trade, 2021. Republic of Türkiye, Ministry of Trade, Green Deal Action Plan, 2021. 2021. https://ticaret.gov.tr/data/60f1200013b876eb28421b23/MUTABAKAT%20YEŞİL.pdf

MENR, 2010. Republic of Türkiye, Ministry of Energy and Natural Resources, Energy Efficiency Strategy Paper. https://www.resmigazete.gov.tr/eskiler/2012/02/20120225-7.htm

MENR, 2017. Republic of Türkiye, Ministry of Energy and Natural Resources, National Energy and Mining Policy (2017).

MENR, 2018. Republic of Türkiye, Ministry of Energy and Natural Resources, National Energy Efficiency Action Plan (2017-2023). https://enerji.gov.tr//Media/Dizin/EVCED/tr/EnerjiVerimliliği/UlusalEnerjiVerimliliğiEylemPlanı/Belgeler/UEVEP.pdf

MENR, 2021. Republic of Türkiye, Ministry of Energy and Natural Resources, https://enerji.gov.tr/Media/Dizin/BHIM/tr/Duyurular//genel_aydinlatma_usul_ve_esaslar_202110120910.pdf

MENR, 2022. Republic of Türkiye, Ministry of Energy and Natural Resources, Türkiye National Energy Plan (2022). https://enerji.gov.tr//Media/Dizin/EIGM/tr/Raporlar/TUEP/Türkiye_Ulusal_Enerji_Planı.pdf

MENR, 2023_a. Republic of Türkiye, Ministry of Energy and Natural Resources, Energy Balance Tables. https://enerji.gov.tr/duyuru-detay?id=20299

MENR, 2023_b. Republic of Türkiye, Ministry of Energy and Natural Resources, Türkiye Electricity Investments Year 2022 Month December Summary Report https://enerji.gov.tr//Media/Dizin/EIGM/tr/Raporlar/PRP/EYÖRA/2022/Aralık/ElektrikYatırımları2022AralıkAyıÖzetRaporu.pdf

MENR, 2024_a. Republic of Türkiye, Ministry of Energy and Natural Resources, Pres entation of 2035 Energy Road Map: https://enerji.gov.tr/Media/Dizin/BHIM/tr/Du yurular//Yenilenebilir%20Enerjide%202035%20Yol%20Haritası%20Lansman%20Sunu mu_202410221014.pdf

MoAF, 2017. Republic of Türkiye, Ministry of Agriculture and Forestry, Structural Ch anges and Reforms in Turkish Agriculture 2003-2016.

MoAF, 2019. Republic of Türkiye, Ministry of Agriculture and Forestry, National Strategy and Action Plan to Combat Desertification (2019-2030). https://webdosya.csb.gov.tr/db/cem/icerikler/collesme-ile-mucadele-ulusal-stratejisi-ve-eylem-plani_k-20211111075541.pdf

MoAF, 2023_a. Republic of Türkiye, Ministry of Agriculture and Forestry, General D irectorate of Forestry, Forestry Statistics 2021. https://www.ogm.gov.tr/tr/e-kutuphane/resmi-istatistikler

MoAF, 2023_b. Republic of Türkiye, Ministry of Food Agriculture and Forestry, Map s of Agricultural Basins, https://www.tarimorman.gov.tr/Sayfalar/Icerikler.aspx?IcerikId=296c5dc2-2d3f-427d-af9a-70c4a2f131a6

MoCT, 2023. Republic of Türkiye, Ministry of Culture and Tourism,

MoEU, 2010. Republic of Türkiye, Ministry of Environment and Urbanization (MoEU), National Climate Change Strategy (NCCS) (2010 - 2023). https://webdosya.csb.gov.tr/db/iklim/editordosya/iklim_degisikligi_stratejisi_EN(2).pdf

MoEU, 2012. Republic of Türkiye, Ministry of Environment and Urbanization (MoEU), National Climate Change Action Plan (NCCAP) (2011 - 2023). https://webdosya.csb.gov.tr/db/iklim/editordosya/file/eylem%20planlari/iklim_degisikligi_eylem_plani_EN_2014.pdf

MoEU, 2016. Republic of Türkiye, Ministry of Environment and Urbanization (MoEU), National Waste Management Action Plan (NWMAP) (2016-2023). https://cygm.csb.gov.tr/ulusal-atik-yonetimi-ve-eylem-plani-2016-2023-hazirlandi.-haber-221234

MoEU, 2019. Republic of Türkiye, Ministry of Environment and Urbanization (MoEU), National Smart Cities Strategy and Action Plan (2020-2023). https://akillisehirler.gov.tr/wp-content/uploads/EylemPlani.pdf

MoEUCC, 2021. Republic of Türkiye, Ministry of Environment, Urbanization and Cli mate Change, Building Industry Energy Efficiency Technology Atlas. https://web

dosya.csb.gov.tr/db/meslekihizmetler/icerikler/atlas_ocak_small-20210126120540.pdf

MoEUCC, 2023_a. Republic of Türkiye, Ministry of Environment, Urbanization and Climate Change; Environmental Statistics. http://cevreselgostergeler.csb.gov.tr/atik-duzenli-depolama-tesis-sayisi-belediye-sayisi-hizmet-verilen-nufus-i-85750

MoEUCC, 2023_b. Republic of Türkiye, Ministry of Environment, Urbanization and Climate Change; Environmental Statistics. https://cevreselgostergeler.csb.gov.tr/kanalizasyon-sebekesiyle-hizmet-verilen-nufus-i-85747

MoEUCC, 2023_c. Republic of Türkiye, Ministry of Environment, Urbanization and Climate Change; Climate Council. https://iklimsurasi.gov.tr

MoIT, 2019. Republic of Türkiye, Ministry of Industry and Technology, Industry and Technology Strategy for 2023. https://www.sanayi.gov.tr/assets/pdf/SanayiStratejiBelgesi2023.pdf

MoNE, 2021. Ministry of National Education, National Education Statistics, Formal Education 2020/'21. https://sgb.meb.gov.tr/meb_iys_dosyalar/2021_09/10141326_meb_istatistikleri_orgun_egitim_2020_2021.pdf

MoNE, 2022. Ministry of National Education. The Climate Change Action Plan. https://merkezisgb.meb.gov.tr/meb_iys_dosyalar/2022_09/29171316_Milli_EYitim_BakanlYYY_Yklim_DeYiYikliYi_Eylem_PlanY.pdf

MoTI, 2020. Republic of Türkiye, Ministry of Transport and Infrastructure. National I ntelligent Transportation Systems Strategy Document and 2020-2023. https://www.uab.gov.tr/uploads/pages/kutuphane/ulusal-akilli-ulas-im-sistemleri-strateji-belgesi-ve-2020-2023-eylem-plani.pdf

MoTI, 2022_a. Republic of Türkiye, Ministry of Transport and Infrastructure. Transport and Logistics Master Plan, 2053. https://www.uab.gov.tr/uploads/pages/bakanlik-yayinlari/20221025-2053-ulastirma-ve-lojistik-ana-plani-eng.pdf

MoTI, 2022_b. Republic of Türkiye, Ministry of Transport and Infrastructure, Budget Presentation. https://sgb.uab.gov.tr/uploads/pages/butce-2023/2023-butce-sunumu-sikistirildi.pdf

MoIT, 2019. Republic of Türkiye, Ministry of Industry and Technology, Industry and Technology Strategy for 2023. https://www.sanayi.gov.tr/assets/pdf/SanayiStratejiBelgesi2023.pdf

MTP, 2021. Republic of Türkiye, Medium - Term Programme (MTP) 2022 - 2024. The Presidency of Strategy and Budget (SBB) https://www.sbb.gov.tr/wp-content/uploads/2021/10/Medium_Term_Programme_2022-2024.pdf

NIR, 2022. TurkStat, Turkish Greenhouse Gas Inventory, 1990 to 2020. National Inv entory Report (NIR) for submission under the United Nations Framework Conventi on on Climate Change. https://unfccc.int/documents/461926

NID, 2024. TurkStat, Turkish Greenhouse Gas Inventory, 1990 to 2022. National Inv entory Document (NID) for submission under the United Nations Framework Con vention on Climate Change. (xxx)

OECD, 2016. OECD, Innovation, Agricultural Productivity and Sustainability in Turk ey, OECD Food and Agricultural Reviews, OECD Publishing, Paris. http:// dx.doi.o rg/10.1787/9789264261198-en

OECD, 2024. OECD, Türkiye Economic Snapshot, Economic Forecast Summary (Otober 2024). https://www.oecd.org/economy/turkiye-economic-snapshot/

OECD, 2024. OECD Data, Passenger transport statistics (Otober 2024). https://data.oecd.org/transport/passenger-transport.htm

TEİAŞ, 2023_a. Republic of Türkiye, Ministry of Energy and Natural Resources, Cap acity of Production Projections. https://www.epdk.gov.tr/Detay/Icerik/3-0-66/elektrikuretim-kapasite-projeksiyonlari

TEİAŞ, 2023_b. Republic of Türkiye, Ministry of Energy and Natural Resources, Türki ye Electricity Production-Transmission Statistics. https://www.teias.gov.tr/turkiye-elektrik-uretim-iletim-istatistikleri

TSMS, 2022. Turkish State Meteorological Service, 2022 Administrative Activity Report

TSMS, 2023, Turkish State Meteorological Service, 2023 https://mgm.gov.tr/eng/Yearly-Climate/State_of_the_Climate_in_Turkey_in_2022.pdf

TurkStat, 2016. Turkish Statistical Institute, Foreign trade by months and years 1985 – 2015 https://data.tuik.gov.tr/Bulten/Index?p=Dis-Ticaret-Istatistikleri-Aralik-2015-21797

TurkStat, 2018. Turkish Statistical Institute, Population Projections, 2018 - 2080, Pop ulation and Demography Statistics, https://data.tuik.gov.tr/Bulten/Index?p=Nufus-Projeksiyonlari-2018-2080-30567

TurkStat, 2021_a. Turkish Statistical Institute, The Results of Address Based Populati on Registration System, 2020, https://data.tuik.gov.tr/Bulten/Index?p=Adrese-Dayali-Nufus-Kayit-Sistemi-Sonuclari-2020-37210

TurkStat, 2021_b. Turkish Statistical Institute, Foreign Trade Statistics, December 20 20, https://data.tuik.gov.tr/Bulten/Index?p=Dis-Ticaret-Istatistikleri-Aralik-2020-37412

TurkStat, 2021_c. Turkish Statistical Institute, Annual Industry and Service Statistics 2020 https://data.tuik.gov.tr/Bulten/Index?p=Yillik-Sanayi-ve-Hizmet-Istatistikleri-2020-37190

TurkStat, 2021_d. Turkish Statistical Institute, Waste Statistics, 2020. https://data.tuik.gov.tr/Bulten/Index?p=Atik-Istatistikleri-2020-37198

TurkStat, 2022_a. Turkish Statistical Institute, Annual Gross Domestic Product, 2021. https://data.tuik.gov.tr/Bulten/Index?p=Yillik-Gayrisafi-Yurt-Ici-Hasila-2021-45834

TurkStat, 2022_b. Turkish Statistical Institute, Building Permits, Quarter IV: October-December, 2021. https://data.tuik.gov.tr/Bulten/Index?p=Yapi-Izin-Istatistikleri-IV.-Ceyrek:-Ekim---Aralik,-2021-45828

TurkStat, 2022. Turkish Statistical Institute, Environmental Statistics, Household Solid Waste Composition and Tendency Survey Results.

TurkStat, 2023_a. Turkish Statistical Institute, The Results of Address Based Populati on Registration System, 2023. https://data.tuik.gov.tr/Bulten/Index?p=Adrese-Dayali-Nufus-Kayit-Sistemi-Sonuclari-2023-49684

TurkStat, 2023_b. Turkish Statistical Institute, National Accounts, Annual National A ccount Statistics, https://biruni.tuik.gov.tr/medas/?kn=136&locale=en

TurkStat, 2023_c. Turkish Statistical Institute, Foreign trade by months and years, 2 013 - 2022 https://data.tuik.gov.tr/Bulten/Index?p=Dis-Ticaret-Istatistikleri-Aralik-2022-49633.

TurkStat, 2023_d. Turkish Statistical Institute, Agricultural Land and Forest Area Stat istics. https://data.tuik.gov.tr/Kategori/GetKategori?p=Tarim-111

TurkStat, 2023_e. Turkish Statistical Institute, Population Projections and Estimation s, New Mid-
year Population. https://data.tuik.gov.tr/Kategori/GetKategori?p=Nufus-ve-Demografi-109

TurkStat, 2023_f. Turkish Statistical Institute, Transportation and Communication St atistics, Road Motor Vehicles Statistics. https://data.tuik.gov.tr/Kategori/GetKategori?p=Ulastirma-ve-Haberlesme-112

TurkStat, 2023_g. Turkish Statistical Institute, Transportation and Communication St atistics, Total Passenger and Freight Traffic at the Airports. https://data.tuik.gov.tr/Kategori/GetKategori?p=Ulastirma-ve-Haberlesme-112

TurkStat, 2023_h. Turkish Statistical Institute, Tourism Statistics, Quarter IV: October-December and Annual, 2022. https://data.tuik.gov.tr/Bulten/Index?p=Turizm-Istatistikleri-IV.Ceyrek:-Ekim-Aralik-ve-Yillik,-2022-49606

TurkStat, 2024_a. Turkish Statistical Institute, Population Projections (2023-2100), 2024. https://data.tuik.gov.tr/Bulten/Index?p=Nufus-Projeksiyonlari-2023-2100-53699#:~:text=Doğurganlık%20göstergelerindeki%20hızlı%20düşüş%20eğiliminin,55%20milyonun%20altına%20düşmesi%20beklenmektedir.

TURSAB, 2024. Association of Turkish Travel Agents (TÜRSAB), Tourism Statistics. https://www.tursab.org.tr/istatistikler

TURÇEV, 2024. Türkiye Foundation for Environmental Education (TÜRÇEV), 2024 Blue Flag Data. http://www.mavibayrak.org.tr/tr/Default.aspx

World Bank, 2023. World Bank national accounts data, and OECD National Accounts data files, Agriculture, forestry, and fishing, value added (% of GDP) https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS