REPUBLIC OF TURKEY
MINISTRY OF ENVIRONMENT,
URBANIZATION AND CLIMATE CHANGE

ENVIRONMENTAL INDICATORS

GENERAL DIRECTORATE OF ENVIRONMENTAL IMPACT
ASSESSMENT, PERMIT AND INSPECTION

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Indicators are tools used to describe complex processes or events in a simple and easily understandable way, such as "a sign or a signal". Environmental Indicators provide quantitative monitoring of the interactions between the environment and human activities and aim to reflect the relationship between the environment and the sectors, to ensure that some activities with environmental impacts can be observed in time series, to monitor the results of the environmental policies implemented, to help in the determination of plans, programs and policies to be made, to help in the preparation of legislation and to inform.

Environmental Indicators Booklets are published every year with updated environmental indicators and while the first publication "Environmental Indicators 2006" consisted of 11 titles and 24 indicators, today it is prepared to include 16 titles and 100 indicators.

Data quality is of great importance in environmental information management. In general, the data and assessments related to the indicators in this booklet are obtained from the relevant authorized institutions that produce these data. Therefore, it should be noted that the accuracy and reliability of these data are the responsibility of the organizations providing the data.
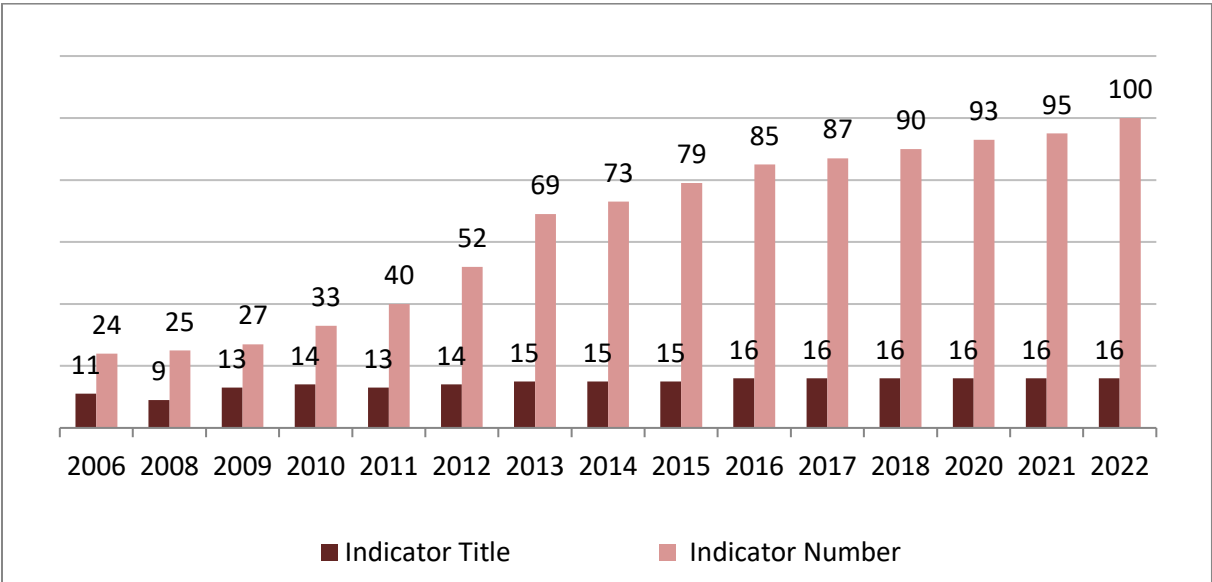
* The years indicated in the graph refer to the year in which the data in the booklet is represented.

CLASSIFICATION OF INDICATORS

In the world, different approaches are applied to the development of environmental indicators and indicator sets are created within different conceptual frameworks or models. One of these is the "Pressure-State-Response (PSR)" framework. In 1994, the OECD (Organization for Economic Cooperation and Development) developed a comprehensive indicator system to serve as a basis for environmental policies and reporting. Another model, the DPSIR framework, was developed by the EEA (European Environment Agency) in 2004 to describe the relationship between society and the environment, building on the PSR framework. This model includes five elements: Driving force, Pressure, State, Impact and Response. With this approach, it is possible to measure the effectiveness of the measures implemented, in other words, to explain the existence relationship between drivers and effects.

D   Driving Force Indicators: They are the factors behind various variables. Broadly speaking, all economic activities fall into this category.

P   Pressure Indicators: They identify variables that cause or may cause environmental problems. These indicators are those that focus directly on the sources of problems. Generally speaking, all emissions fall into this class.

S   State Indicators: They are indicators of the current state of the environment. In general, all concentration measurements fall into this class.

I   Impact Indicators: These are the most extreme impacts caused by environmental changes. In general, indicators related to health problems caused by environmental changes fall into this category.

R   Response Indicators: Response indicators include the reactions of society and individuals to changes in the state of the environment and official attempts to prevent, compensate for, improve or adapt to these changes. In other words, indicators related to solutions to environmental pollution fall into this category.

e.g. Industry and transportation

e.g. Cleaner production, public transport , legal regulations, tax information

Driver

Response

Pressure

Impact

i.e. Polluting emissions

i.e. Heath, biodiversity loss, economic damage

State

i.e. Air, water, soil quality
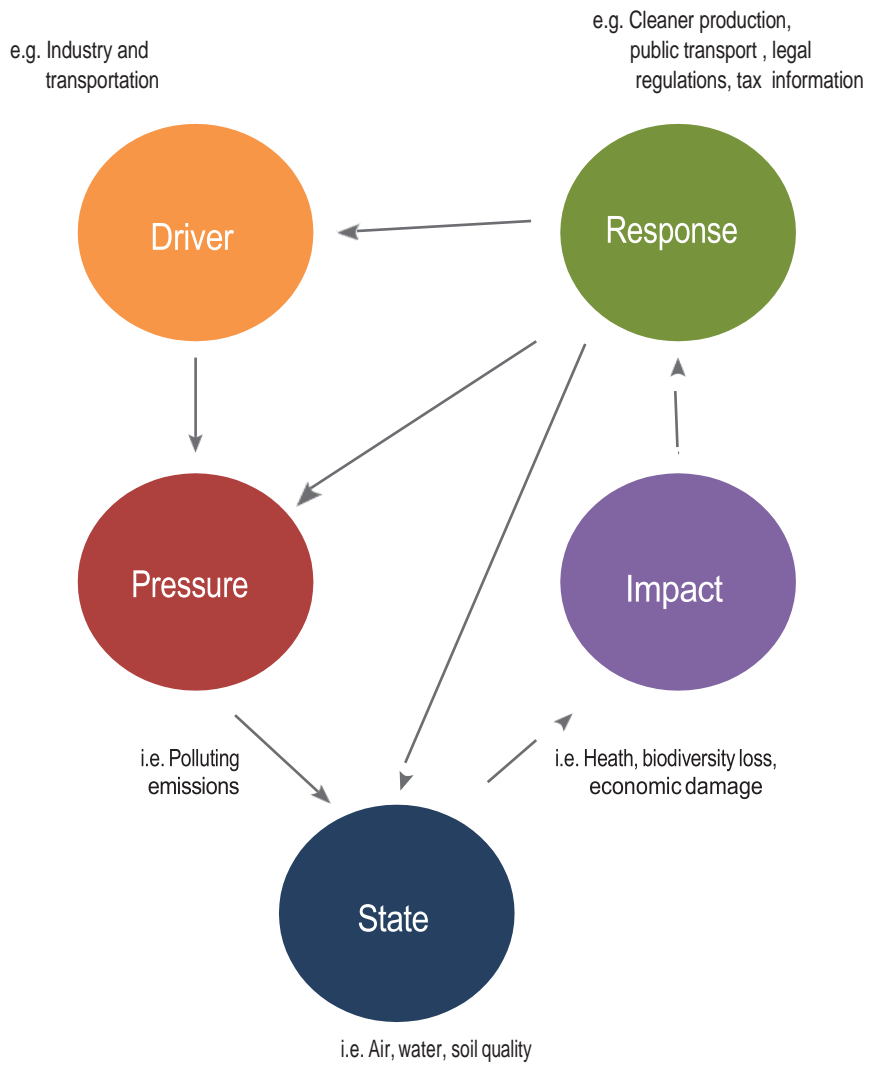
We can categorize the indicators in the booklet accordingly as follows;

Driving Force Indicators	Pressure Indicators	State Indicators
• Population Growth • Urban-Rural Population Ratio • Migranti Population • Resource Efficiency • Safe Drinking Water Access Rate • Domestic Material Consumption per Capita • Consumption of Ozone Depleting Substances (ODS) • Passengers and Freight Transported by Mode Of Transport Final Energy Consumption by Mode Of Transport • Share of Alternative Fuel Vehicles • Number Of Road Motor Vehicles • Average Age of Vehicles Registered to the Traffic Actual Change in Transportation Prices by Type • Taxes/ Expenditures and Subsidies in TransportTotal Energy Consumption by Sector • Primary Energy Consumption by Fuel • Final Energy Consumption by Sector • Energy Consumption per Capita • Primary Energy Production • Final Energy Intensity	• Greenhouse Gas Emissions • Total Greenhouse Gas Emissions by Sector • Air Pollutant Emissions • Large Combustion Plants • Use of Freshwater Resources Drinking and Utility Water Supplies of Municipalities • Amount of Municipal Waste and Disposal Amount Hazardous and Non-Hazardous Wastes • Medical Waste • Waste Oils, Vegetable Waste Oils, Waste Batteries andWaste Accumulators, Waste Electrical and Electronic Equipment, End-of-Life Tires and Enf-of-Life Vehicles • Mining Waste • Packaging Waste • Ship-Sourced Waste • Misuse of Agricultural Areas Invasive Alien Species • Highway -Railway Network Intensity Greenhouse Gas Emissions by Mode Of Transport Emission of Air Pollutants from Transport • Number of Motorized Land Vehicles • Distance traveled by registered road motor vehicles Thermal Electricity and Cogeneration Power Plant Efficiencies • Number of Mining Facilities by GroupChemical Fertilizer Consumption • Use Of Pesticides Aquaculture Production • Fishing Fleet Capacity • Number of TouristNumber of Tourist Overnight Stays and Number of Beds per 1000 Inhabitants • Number of Overnight Stays in Tourism Operation Certified Facilities by Province Disasters by Type	• Life Expectancy at Birth • Access to Safe Drinking Water • Sectoral Distribution of Employment • Sectoral Distribution of Gross Domestic Product • Temperature • Average Concentrations Of PM10 And SO2 In Ambient AirNumber of Exceedances of Air Quality Limit Values • Oxygen Consuming Substances in Rivers • Nutrients in Freshwater Resources • Chlorophyll-a in Coastal and Marine Waters • Nutrients in Coastal and Marine Waters • Oxygen Concentrations in the Marine Wate Bathing Water Quality • General Distribution of Land Cover Zones Risk of Erosion Distribution of Forested A • Distribution of Forest Areas According Tr Species • Distribution of Forests by Their Main Fun • Dead Wood • Agricultural Land per Capita • Blue Flag Applications • Green Key Applications

Impact Indicators	Response Indicators
• Waterborne Diseases • Precipitation • Sea Surface Temperature • Heating and Cooling Day-Degrees • Number of storm disasters • Forest Ecosystem Exposed to Pollutants such as Ozone (O3), Sulfur Dioxide (SO_2), Ammonia (NH_3) and Nitrogen Dioxide (NO_2) • Total Number of Species, Endangered Species, Rate of Endemism (Biodiversity) • Primary and Final Energy Intensity • Natural Disasters • Forest Fires • Disasters by Type	• Environmental Protection Expenditures • - Carbon Sinks and Capture • Number of Air Quality Monitoring Stations • Municipalities Served by Wastewater Treatment Plants • Wastewater Treatment Plant Energy Incentive Payment • Population Served by Sewerage System • Municipal Waste Disposal • Disposal and Recycling of Various Wastes • Zero Waste Management System • Municipal Waste Recovery Rate • Protected Areas for • Wildlife Conservation ActivitiesRegulation And Supervision Of Wild Animal Trade In Accordance With International Conventions • Forest Facility Works • Share of Renewable Energy Sources in Gross Final Energy Consumption • Share of Renewable Resources in Gross Electricity Consumption Primary and Final Energy Intensity • Energy Efficiency in Buildings • Share of Total Domestic and International Sales Values of Enterprises Operating in Organized Industrial Zones in All Industrial Enterprises • Number and Area of Mine Closed After Operated • Laboratories Operating Under Environmental Legislation Environmental Impact Assessment Decisions • Organic Farming Lands And Production Amounts Good Agricultural Practices • Number of Environmentally Friendly Accommodation Facilities • Number of Risk Assessment and Emergency Response Plans Liability Insurances within the Scope of Environmental Legislation
Impact Indicators	Response Indicators

SUMMARY TABLE OF ENVIRONMENTAL INDICATORS

IN TERMS OF ENVIRONMENTAL IMPROVEMENT TREND COMPARED TO PREVIOUS YEAR

| ↑ | Negative Developments Increasing Tendency |
| ↓ | Negative Developments Declining Tendency |

| ↑ | Positive Developments Increasing Tendency |
| ↓ | Positive Developments Declining Tendency |

| → | Neutral Developments |
| x | No Comparative Data Available. |

POPULATION	
POPULATION	↑
Population Growth Rate	↓
Urban-Rural Population Ratio	↑
Migrating Population	↑

ECONOMY	
Resource Efficiency	↑
Domestic Material Consumption per Capita	↑
Environmental Protection Expenditues	↑
Share of Environmental Protection Expenditures in GDP	↑

HEALTH	
Life Expectancy at Birth	↓
Safe Drinking Water Access Rate	↑

CLIMATE CHANGE	
Greenhouse Gas Emissions	↑
Carbon Sinks and Capture	↓
Consumption of Ozone Depleting Substances (ODS)	↓

Precipitation	↓
Temperature	↓
Sea SurfaceTemperature in the Mediterranean	↓
Sea Surface Temperature in the Aegean Sea	↓
Sea Surface Temperature in the Black Sea	↑
Sea Surface Temperature in Marmara Sea	↑
Heating and Cooling Day-Degrees	↑
Number of storm disasters	↓

AIR POLLUTION	
NH_3, NO_X and SO_2 Emissions	↑
NM_{VOC}, CO, PM_{10} Emissions	↓
Number of Large Combustion Plants and Total Thermal Power	↓
Number of Exceedances of Air Quality Limit Values for PM10 Parameter	↑
Number of Exceedances of Air Quality Limit Values for SO_2 Parameters	↓
Number of Air Quality Monitoring Stations	↑
(Forest Ecosystem exposure) NH_3, NO_2, SO_2 and O_3 pollutants	x

WATER-WASTEWATER	
Use of Freshwater Resources	↓
Excellent Quality Class Swimming Water Rate	X
Amount of Water withdrawn by Municipalities for Drinking and Utility Water Network	↓
Ratio of Number of Municipalities Served by Wastewater Treatment Plants to Total Number of Municipalities	↑
Ratio of Municipal Population Served by Wastewater Treatment Plants to Total Municipal Population	→
Wastewater Treatment Plant Energy Incentive Payment	↑
Ratio of Number of Municipalities Served by Sewerage Network to Total Number of Municipalities	↑
Proportion of Population Served by Sewerage Network in Municipality Population	↑
Average Daily Per Capita Amount of Wastewater Discharged by Municipalities through Sewerage Network	↑

WASTE	
Number of Landfill Facilities	↑
Ratio of Population Served by Landfill Facilities to Total Municipality Population	↑
Recovery Rate of Hazardous and Non-Hazardous Wastes	↑
Mining Waste Amount Recycling Amount	↑
Number of Municipalities Receiving Basic Level Zero Waste Certificate for Service Area	↑
Municipal Waste Recycling Rate	↑

LAND USE	
Artificial Territories	X
Agricultural Arias	X
Forest and Semi-Natural Areas	X
Wetlands	X
Areas Under Risk of Erosion	X

BIODIVERSITY	
Total Number of Species, EndangerendSpecies, Endemism Rate	X
Number of Invasive Foreign Species in the Seas	X
Number of Terrestrial Invasive Foreign Species	X
Size of Protected Area	↑
Length of Protected Coast	→
Forest Areas	↑
Forest Facility Works	↓

INFRASTRUCTURE AND TRANSPORTATION	
Road Network	↑
Railway Network	↑
Road Passenger Transportation Rate (passenger-km)	↓
HighwayFreight Transportation Rate (tons- km)	↓
Rail Passenger Transportation Rate (passenger-km)	↑
Rail Freight Transportation Rate (ton-km)	↑
Capacity Utilization Rate of Freight Transportation by Rail	↑
Greenhouse Gas Emissions from Transportation	↑

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Emission of Air Pollutants from Road Transportation	↓
Final Energy Consumption from Transportation	↑
Share of Alternative Fuel Vehicles	↑
Number of Motorized Land Vehicles	↑
Average Age of Vehicles Registered in Traffic	↑
Payments under Public Service Obligation in the Railway Sector	X
Incentives for maritime transportation	X

ENERGY	
Total Energy Consumption	↑
Share of Solid Fuels in Primary Energy Consumption	↓
Total Final Energy Consumption	↑
Energy Consumption Per Capita	↑
Primary Energy Production	↑
Share of Renewable Energy Sources in Consumption	↓
Ratio of Electricity Generated from Renewable Sources	↓
Primary Energy Intensity	↓
Final Energy Intensity	↓
Energy Efficiency in Buildings	↑
Share of Thermal Electric Power Generation in Total Generation	↓

INDUSTRY AND MINING	
Share of Total Domestic and International Sales Values of Enterprises Operating in Organized Industrial Zones in All Industrial Enterprises	X
Number of Mine Quarries/Facilities Rehabilitated After Operation	↑
Mine Quarry/Facility Area Rehabilitated After Operation	↑
Number of Laboratories Operating within the Scope of Environmental Legislation	↑

AGRICULTURE	
Agricultural Area per Capita	→
Chemical Fertilizer Use	↓
Agricultural Pesticide Use	↑
Ratio of Organic Agriculture Areas in Total Agricultural Areas	↓
Good Agricultural Practices Production Area	↓

FISHERY	
Aquaculture Fishing	↑
Aquaculture Production	↑
Number of Fishing Vessels	↓

TOURISM	
Number of Tourists	↑
Environmentally Friendly Accommodation Facility	↓
Tourist Overnight Stays per 1000 Residents	↑
Number of Tourist Beds per 1000 Residents	↑
Number of Blue Flag Beaches	↑
Number of Blue Flag Marina	↑
Number of Blue Flag Yachts	↓
Number of Blue Flag Tourism Boats	↑
Number of Green Keyed Facilities	↑
Number of Overnight Stays in Tourism Management Certified Facilities	↑

DISASTERS	
Number of Forest Fires	↓
Burnt Forest Area	↓
Number of Approved Coastal Facility Risk Assessment and Emergency Response Plans	↑

EXECUTIVE SUMMARY

According to the contents of the Environmental Indicators booklet;

Population

According to 2022 TURKSTAT (Turkish Statictical Institute) data, Turkiye's total population increased by 599,280 people compared to the previous year, reaching 85,279,553 people. Turkiye's population growth rate decreased from 1.27% in 2021 to 0.71% in 2022. If the current trends in demographic indicators continue, Turkiye's population is expected to reach 86,907,367 people in 2023 and 100,331,233 people in 2040. Our population will increase until 2069 and reach its highest value with 107,664,079 people. Starting from this year, the country's population is expected to decrease and reach 107,100,904 people in 2080.
According to the net migration rate in 2021-2022 period, the provinces with the highest immigration were Tekirdağ, Yalova and Kocaeli, while the provinces with the highest emigration were Ağrı, Ardahan and Gümüşhane.

Economy

According to 2021 data, for every kilogram of material consumed in Turkiye, a gross domestic product (GDP) of EUR 1.7 is generated, while this figure is EUR 2.3 in EU-27 countries.
Domestic material consumption per capita in Turkiye is 11.5 tons as of 2021, below the EU-27 average of 14.3 tons.
Environmental protection expenditures increased by 59.2% in 2021 compared to the previous year and totaled TL 66.3 billion..

Health

Although life expectancy in Turkiye is increasing, it is still below the European Union average with 77.7 years in 2019-2021. Life expectancy at birth is expected to increase in Turkiye and the population is expected to continue aging. According to TURKSTAT data, 95.3% of the population in Turkiye benefited from piped water systems in 2006, compared to 99.7% in 2022.

Climate Change

Turkiye's total greenhouse gas emissions in CO_2 equivalent in 2021 were calculated as 564.4 million tons (Mt) CO_2 equivalent (equivalent), an increase of 7.7% compared to the previous year.
Despite increasing in parallel with energy consumption in Turkiye, greenhouse gas emissions in equivalent (per capita) terms, calculated as 6.7 tons CO_2/capita in 2021, are below the average of EU countries. The energy sector has the highest share in greenhouse gas emissions with 71.3%.

2008 was the driest year since 1930 (444.9 mm). Annual precipitation across the country has been below normal for the last 3 years. The areal precipitation average of our country in 2022 was realized as 503.8 mm and there was a 12.1% decrease in precipitation compared to normal and 4.0% decrease compared to last year's precipitation. 2022 average temperature in Turkiye was 14.5 °C, 0.6 °C above the 1991-2020 average of 13.9 °C.

Air Quality

Despite the decrease in air pollutant emissions in recent years, air pollution continues to be a problem. In 2022, the total number of limit value exceedances of pollutants is 36334 for PM_{10} parameter and 322 for SO_2 parameter. In the last five years, the stations with the highest annual averages were Iğdır, Malatya, Muş, Şırnak, Çorum, Erzincan, Kilis for PM_{10} and Hakkari, Edirne, Şanlıurfa, Bitlis, Yozgat, Tunceli and Van for SO_2. The impact of heating pollutants on air pollution, especially in winter, continues to be a problem. In order to improve air quality, it is considered that additional measures are needed in addition to the continuation of existing efforts.

Water-Wastewater

According to DSİ (State Water Affairs) data, sectoral water use for 2022 is 44 billion m³ (77%) for irrigation, 13 billion m³ (23%) for drinking, utilization and industry, and 57 billion m³ for total water use. The pollution and eutrophication observed in our river basins and seas are thought to be caused by

urban, industrial and agricultural wastewater. Phosphorus compounds have been measured at the highest level in every season in the Bandırma Bay of the Marmara Sea, drawing attention to the continuous presence of industrial and domestic pressures.

Serious investments are being made in wastewater treatment in Turkiye, and the ratio of the number of municipalities served by wastewater treatment plants to the total number of municipalities reached 54% in 2022. The ratio of the municipal population served by wastewater treatment plants to the total municipal population is 77.7%. In order to ensure the efficient operation of wastewater treatment plants and to improve the water quality of receiving environments, the Ministry of Environment, Urbanization and Climate Change made a support payment of 231.4 million TL to 795 facilities in 2022 within the scope of energy incentives.

According to the results of the monitoring carried out in 2022, our swimming waters were evaluated as excellent quality (79%), good quality (11%), adequate quality (6%), poor quality (4%).

Waste

The amount of waste increases with the continuous increase in population and consumption. In line with the general principles of waste management, the rate of population served by sanitary landfills and the rate of waste recovery have increased with the works and investments made, especially the zero waste mobilization, but the total recovery rate still lags behind the EU average. As of the end of 2022, 95 municipalities' residential areas have been granted the Basic Level Zero Waste Certificate and the activities within the scope of Zero Waste continue to increase.

Land Utilization

Land use is considered important for the protection of the environment and natural resources as well as climate change and sustainable development, and it is aimed to protect natural areas and limit the proportion of built-up areas. As in the rest of the world, there is a decrease in the proportion of natural areas and an increase in the proportion of built-up areas in Turkiye. The amount of agricultural land allowed for misuse has been lower compared to previous years.

Biodiversity

Turkiye is the gene center of many plants and has an important place in the world in terms of biodiversity, but some of our plant and animal species are endangered and some of our species that existed in the past have become extinct.

For example, the rate of endemism in the flowering plant group among seed plants is around 34%. Although Turkiye is very rich in endemic plants, some of these rich species are facing serious threats.

In 2016, the ratio of total protected areas to the country's surface area was 8%, while this ratio increased over the years and reached 13.7% in 2022.

Infrastructure and Transportation

The transportation sector continues to be one of the leading sectors in terms of its environmental impacts. The number of motor vehicles in Turkiye is increasing along with the growing population, but the number of motor vehicles relative to the population is far below the European Union average.

In 2021, 16.2% of total GHG emissions came from transportation, 94.8% of which came from road transportation.

Most of the 30,346 thousand TOE (Tons of Oil Equivalent) of energy consumed in the transportation sector in Turkiye in 2021, excluding pipelines, was provided from fossil fuels. The number of electric-hybrid vehicles is gradually increasing in the distribution of fuels used according to the types of vehicles registered in traffic, reaching 264,329 in 2022.

Energy

The use of renewable energy sources is important as they contribute to GHG reduction per unit of energy consumption. The amount of energy supplied from renewable sources increased by 274% in 2021 compared to 1990. In the same period, total energy consumption increased by 204% and net electrical energy consumption by 512%.

In 1990, the contribution of renewables to Turkiye's primary energy consumption was 18.4%, while in 2021, this ratio reached 15.6% due to the decline in fuel wood consumption and the increase in total

energy consumption.
The ratio of electricity generated from renewable sources (118,567 GWh) to gross electricity consumption was 35%.
Primary energy intensity, an indicator of energy efficiency, was 0.141 toe (Tonnes of Oil Equivalent)/thousand 2015$ in 2021, lower than the world average of 0.171 toe (Tonnes of Oil Equivalent)/thousand 2015$ but above the OECD average.

Industry

When the distribution of 6,926 "EIA Positive" decisions taken between 1993, when the first EIA Law was published, and the end of 2022 is analyzed by sectors, it is seen that petroleum and mining investments lead with 29%, followed by energy investments with 22%, waste-chemical sector with 14% and agriculture-food sector investments with 13%.

Agriculture

Agricultural activities are among the major sources of environmental pollution. Irrigation, fertilizer and chemical use, and land use changes are the main environmental pressures. The amount of chemical fertilizers used as pure plant nutrients (N, P_2O5, K_2O) in Turkiye by the end of 2022 was 2,313,689 tons, a decrease of 10.15% compared to 2021. The amount of chemical fertilizer use as pure plant nutrients per hectare of total cultivated agricultural land in Turkiye is 97 kg by the end of 2022.
The total amount of pesticide use in Turkiye in 2022 increased by 4.5% compared to 2021 and reached 55,374 tons.

Fishery

According to TURKSTAT data, total aquaculture production in Turkiye was 849,808 tons in 2022.
In 2022, compared to the previous year, fishing in marine and inland waters increased by 2.7% and aquaculture production increased by 9.1%. While hunting production was 335,003 tons, aquaculture production was 514,805 tons. Of the aquaculture production, 28.4% was realized in inland waters and 71.6% in the seas.
 In order to protect fisheries resources and ensure the sustainability of our fisheries, no new vessel licenses have been issued since 2002, limiting the further growth of the fleet. In addition, since 2012, fishermen who wanted to take their vessels out of fishing were given support payments according to vessel length in return for the cancellation of their licenses.

Tourism

Turkiye ranks high in the world in terms of the number of tourists arriving and tourism revenues generated. In 2019, the number of tourists, which increased by 11.85% compared to 2018, decreased by 68.95% in 2020 compared to 2019 due to the Covid-19 outbreak that affected the whole world. In 2021, the number of tourists increased by 88.28% compared to 2020 as the impact of the Covid-19 outbreak decreased and life started to normalize.
The number of tourists in Turkiye increased from 29,925,441 in 2021 to 50,452,799 in 2022. In 2022, the number of tourists increased by 68.60% compared to 2021.
On the other hand, the high number of visitors coming to the country in a certain period puts pressure on the environment due to land use, water consumption, wastewater, waste production, noise, etc. As a measure against this, as of the end of 2022, the number of accommodation facilities with Tourism Management Certificates was 4,830 and 441 of these facilities (9.13%) were certified with an environmentally friendly accommodation facility certificate (green star). In addition, according to data from 2022, Turkiye ranks third after Spain and Greece with 531 blue flag beaches and seventh in the world with 24 marinas. This situation requires more precautions in environmental issues in touristic areas. In 2022, the Green Key Program, which has been carried out by the Turkish Environmental Education Foundation (TÜRÇEV) since 2011, ranked tenth with 103 facilities.

1

POPULATION

1.1.   Population Growth Rate

D B D E T

Population growth is important as it is the main driving force for human activities that put pressure on the environment.

Although the population growth rate has decreased from time to time, Turkiye's population has continuously increased. However, Turkiye's population growth rate decreased from 1.27% in 2021 to 0.71% in 2022. According to 2022 data, the total population in Turkiye was 85,279,553 people and the population density (population per km^2) was 111 people. The median age in Turkiye increased from 33.1 years in 2021 to 33.5 years in 2022[1].

Graph 1- CHANGE IN POPULATION AND POPULATION GROWTH RATES BY YEARS
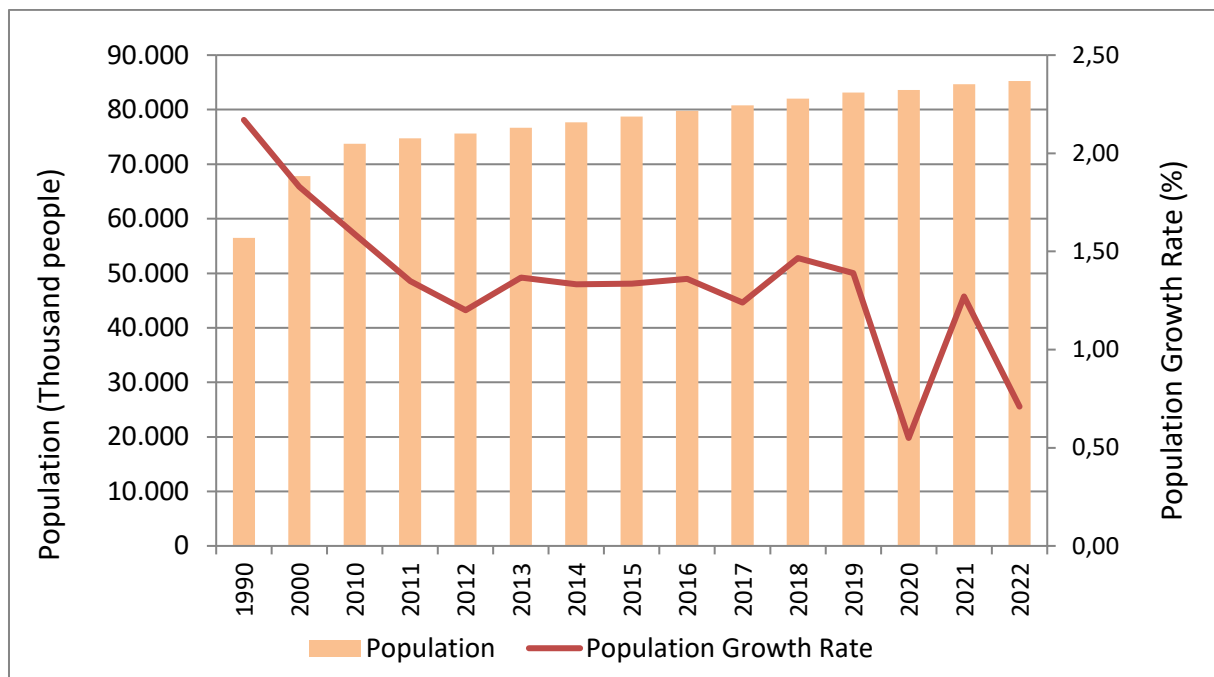
Table 1- POPULATION AND POPULATION GROWTH RATES BY YEARS

YEARS	1990	2000	2010	2015	2016	2017	2018	2019	2020	2021	2022
Population (Thousand people)	56.473	67.804	73.723	78.741	79.815	80.811	82.004	83.155	83.614	84.680	85.280
Population Growth Rate (%)	2,17	1,83	1,59	1,34	1,36	1,24	1,47	1,39	0,55	1,27	0,71
Population Density (person/km2)	73	88	96	102	104	105	107	108	109	110	111

Source: TURKSTAT General Population Census results for 1990-2000 and Address Based Population Registration System results for 2010-2022.
Note: While calculating the annual population growth rates, the administrative division structure of the last year was taken into account

Population projections are of great importance in making policies for the future. Determining the current population trends and making predictions about the future population structure in case these trends continue enables healthier policies to be produced.

Turkiye's population is expected to reach 86,907,367 in 2023 and 100,331,233 in 2040. The population is projected to increase until 2069, reaching its highest value with 107,664,079 people. The population of Turkiye, which is expected to decrease starting from this year, is expected to reach 107,100,904 people in 2080.

Life expectancy at birth is expected to increase in Turkiye and the population is expected to continue aging. The median age, which is an important indicator of the age structure of the population, is expected to be 33.5 in 2023, 38.5 in 2040, 42.3 in 2060 and 45 in 2080[2].

Graph 2- POPULATION PROJECTIONS BY YEAR, 2025-2080
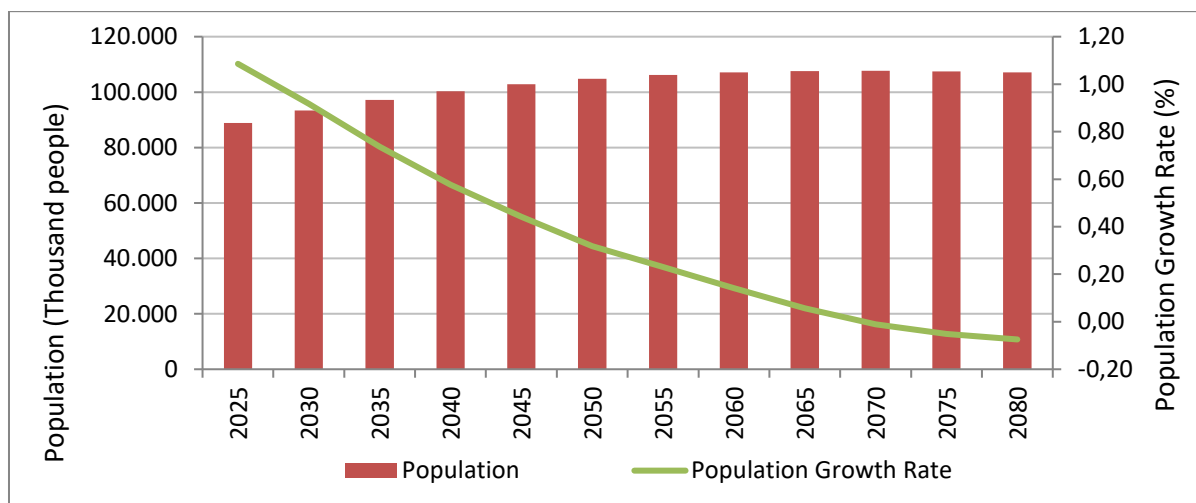
Table 2- POPULATION PROJECTIONS BY YEARS, 2019-2080

Years	2019	2020	2025	2030	2035	2040	2045	2050
Population (Thousand people)	82.886	83.900	88.845	93.329	97.177	100.331	102.844	104.749
Population Growth Rate (%)	1,24	1,22	1,09	0,92	0,74	0,58	0,44	0,32
Population Density (person/km^2)	108	109	115	121	126	130	134	136

Years	2055	2060	2065	2070	2075	2080
Population (Thousand people)	106.150	107.096	107.577	107.653	107.453	107.101
Population Growth Rate (%)	0,23	0,14	0,06	-0,01	-0,05	-0,07
Population Density (person/km^2)	138	139	140	140	140	139

Source: TURKSTAT, Population Projections, 2018-2080

1.2- Urban-Rural Population Ratio

Urban population is a driving force on environmental values. The rapid increase in the urban population and the consequent expansion of cities increases the need for infrastructure, transportation, housing, industrial areas and energy, while bringing environmental problems such as wastewater, noise and air pollution. Urbanization is one of the important processes parallel to industrialization and economic development.

According to the first census in 1927, the population of Turkiye was 13,648,270.

While 75.8% of the population lived in towns and villages and 24.2% in provincial and district centers, the population started to gather in urban areas after 1950. According to the results of the Address Based Population Registration System 2022 announced by TURKSTAT, 93.4% of the population lives in provincial and district centers.

According to World Bank data, 77% of Turkiye's population will live in urban areas in 2022.

Today, about half of the world's population lives in urban areas and this ratio is projected to increase to two-thirds by 2050. Approximately 75% of Europe's population lives in cities[3].

Graph 3- URBAN POPULATION RATES IN TURKIYE AND THE WORLD BY YEARS (%)
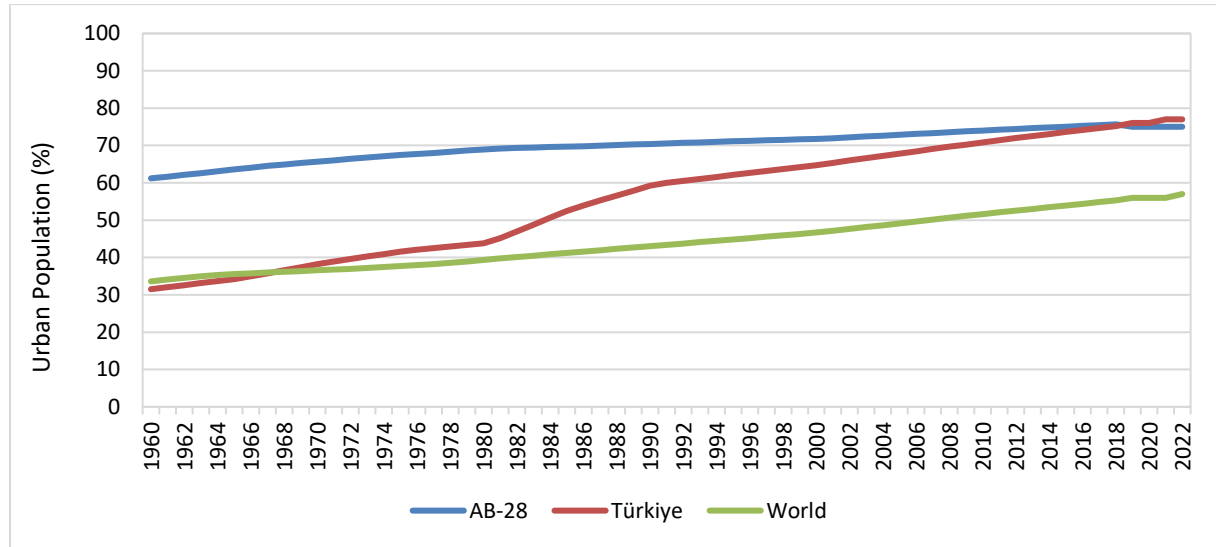
Source: World Bank (World Bank Indicators), https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS?contextual=default

1.3- Migrant Population

Internal migration is defined as a change of permanent residence address in certain areas within the borders of the country within a year. Demographic movements such as rapid population growth and migration from rural to urban areas are driven by the conditions necessitated by economic development.

According to the results of the Address Based Population Registration System, while the population migrating between provinces in Turkiye was 2,273,492 people in 2007-2008, it became 2,791,156 people in 2021-2022. While the ratio of the population migrating between provinces to the total population, which was 3.2% in the 2007-2008 period, was on the rise until 2018, it decreased to 2.7% in the 2019-2020 period. In the 2021-2022 period, it increased to 3.3%.

According to the net migration rate in 2021-2022, Tekirdağ, Yalova and Kocaeli were the provinces with the highest immigration, while Ağrı, Ardahan and Gümüşhane were the provinces with the highest emigration[4].

Graph 4- MIGRANT POPULATION, 2008-2022
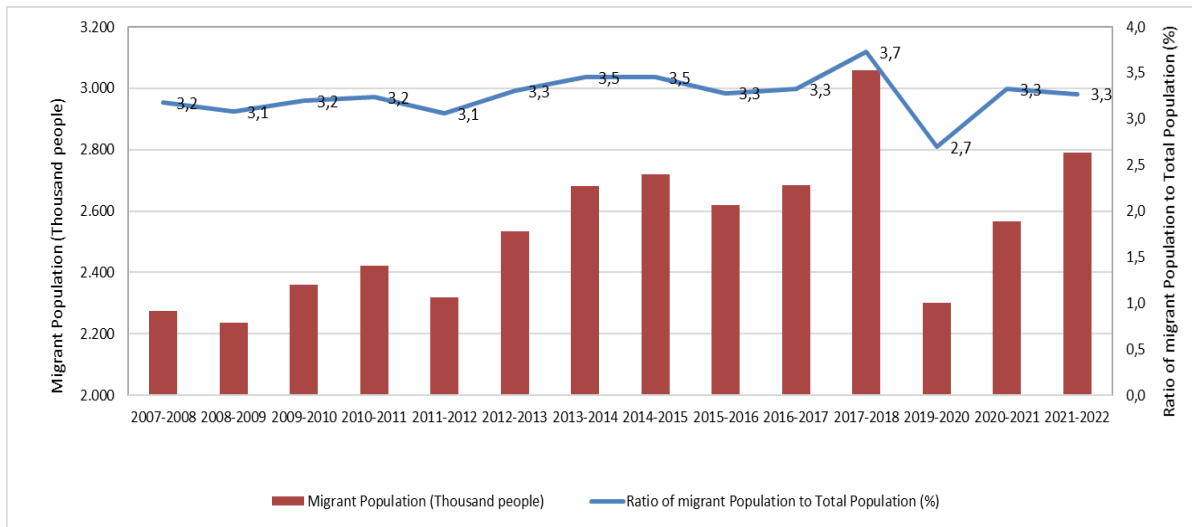
Source: TURKSTAT, Address Based Population Registration System results, 2021-2022 TURKSTAT; 2023

Note: These figures do not include the foreign population in Turkiye.

2
ECONOMY

2.1- Resource Efficiency

D B D E T

Economic activities put pressure on the environment; therefore, resource productivity is defined to indicate the environmental efficiency of the economy. Resource productivity is the ratio of gross domestic product to domestic material consumption. The amount of domestic material consumption is calculated by adding the annual amount of raw materials consumed from domestic sources and the amount of physical imports and subtracting the amount of physical exports.

According to 2021 data, for every kilogram of material consumed in Turkiye, a gross domestic product (GDP) of €1.7 was generated, while in EU-27 countries this figure was €2.3[5].

Graph 5- RESOURCE EFFICIENCY BY YEARS

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
AB-27 (2020)	100	102	102	102	100	101	102	101	104	113	118	114	123	126	126	129	132	132	132	134	132	134
Türkiye	100	113	117	119	124	115	107	111	112	110	99	104	122	132	133	131	133	136	152	173	163	178
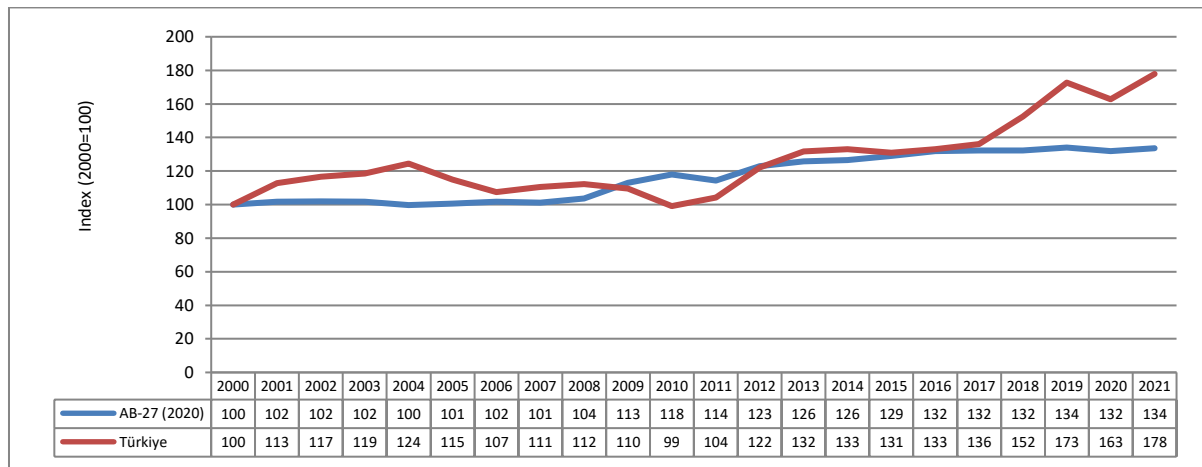
Source-TURKSTAT 2023, Eurastat 2023

GDP in purchasing power standards (code: RP_PPS) should be used for cross-country comparison of the resource efficiency indicator.

Domestic material consumption per capita indicates the level of efficient use of production and inputs for the national economy. Domestic material consumption per capita in Turkiye decreased from 14,045 tons in 2012 to 11.5 tons in 2021. The average per capita consumption of domestic materials in EU-27 countries decreased from 15.3 tons in 2000 to 14.3 tons in 2021[6].

Turkiye's per capita domestic material consumption is below the average of EU-27 countries as of 2021.

Graph 6- DOMESTIC MATERIAL CONSUMPTION PER CAPITA BY YEARS

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Türkiye	11,9	11,8	13,8	12,8	12,9	13,4	12,1	10,6	11,4	11,5
AB-27	14,0	13,7	13,6	13,8	13,7	14,1	14,3	14,4	13,8	14,4
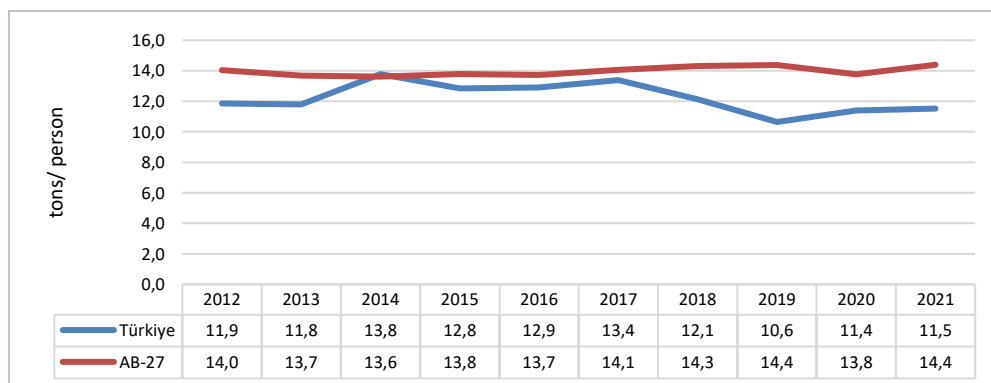
Source: TURKSTAT 2023, Eurastat 2023

Graph 7- CONSUMPTION BY MATERIAL CATEGORY (tons per capita)
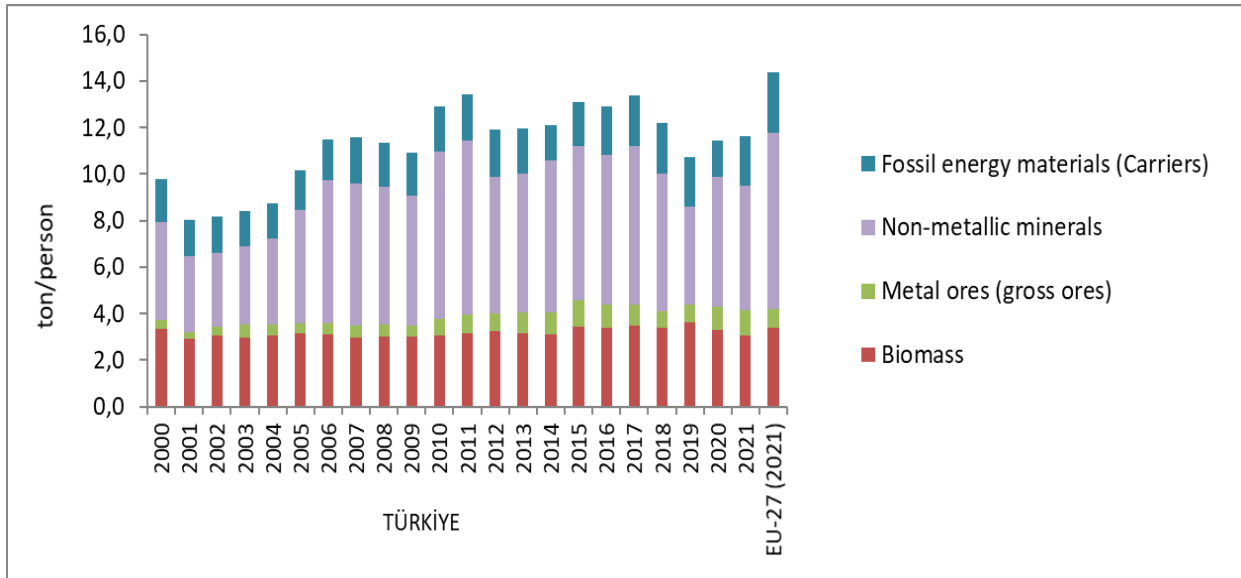
Sources: 1) TURKSTAT, 2023   2) Eurostat

2.2- Sectoral Distribution of Employment

This indicator is a state indicator and is important in that the distribution of the working population across sectors affects the nature and extent of the pressure of the population on the environment.

Over the years, Turkiye has seen a decline in employment, particularly in the agricultural sector, and an increase in employment in the services sector. According to 2022 data, the services sector accounts for 56.5% of employment in Turkiye, compared to 71.9% in EU-27 countries.

In 2022, the sectoral distribution of employment is as follows: agriculture 3.6%, construction 6.7%, industry 17.7%, services 71.9% in EU-27 countries, agriculture 4.6%, construction 7.3%, industry 14.4%, services 73.7% in OECD countries (Organization for Economic Cooperation and Development)[7].

Graph 8- SECTORAL DISTRIBUTION OF EMPLOYMENT
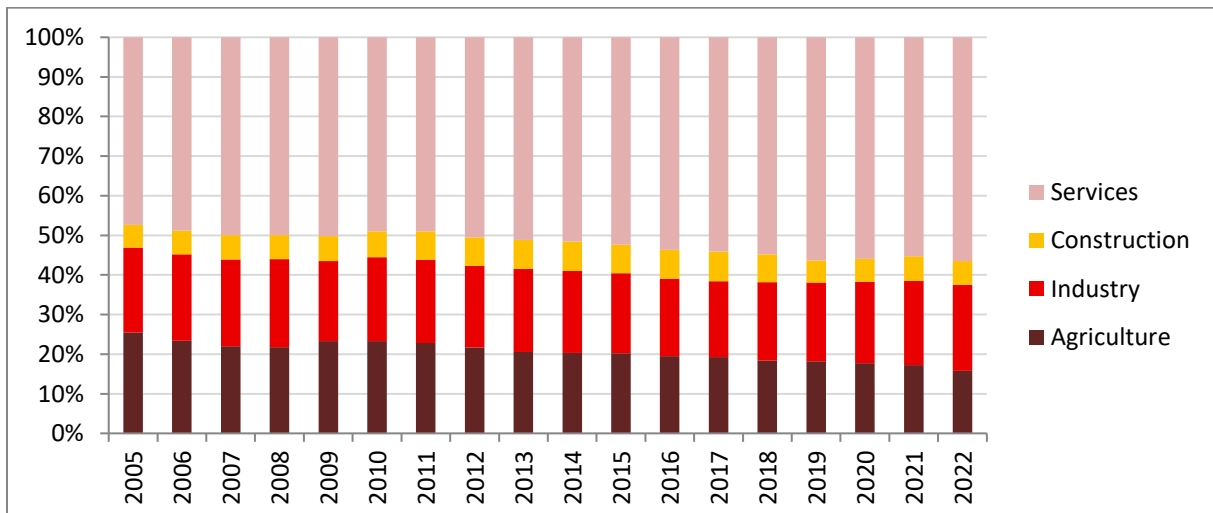
Table 3- SECTORAL DISTRIBUTION OF EMPLOYMENT

Year	2005		2010		2015		2020		2021		2022	
	Thousand people	%	Thousand people	%	Thousand people	%	Thousand people	%	Thousand people	%	Thousand people	%
Total	19 357	100,0	21 810	100,0	26 501	100,0	26 695	100,0	28 797	100,0	30 752	100,0
Agriculture	4 945	25,5	5 073	23,3	5 357	20,2	4 737	17,7	4 948	17,2	4 866	15,8
Industry	4 140	21,4	4 619	21,2	5 345	20,2	5 482	20,5	6 143	21,3	6 663	21,7
Construction	1 096	5,7	1 423	6,5	1 916	7,2	1 546	5,8	1 777	6,2	1 846	6,0
Service	9 176	47,4	10 696	49,0	13 884	52,4	14 930	55,9	15 928	55,3	17 378	56,5

Note: Economic activity branches are based on NACE Rev.2.
Source: TURKSTAT, Labor Force Statistics,
https://data.TURKSTAT.gov.tr/Bulten/DownloadIstatistikselTablo?p=Ph/dUXlt04Tay7nlKK1SCtMalcY6wrcQUAJzHWzuymyTduDKtFwIASBloFVHsxdf
Note: 2005-2020 results are estimated with the econometric model.

2.3- Sectoral Distribution of Gross Domestic Product

This indicator is a situation indicator and shows the contribution to GDP by agriculture, industry, construction and services. The indicator shows the percentage share of the branches of economic activity in gross domestic product at current prices (at purchasers' prices).

According to TURKSTAT data, GDP at current prices according to the production method increased by 43.6% in 2021 compared to the previous year and reached 7 trillion 248 billion 789 million TL. In 2021, excluding taxes and subsidies, the share of agriculture, forestry and fishing sector was 5.5%, the share of the industrial sector was 22.2%, the share of the construction sector was 5.1% and the share of the services sector was 67.2%.

Looking at the distribution of gross value added by economic activity in EU-27 countries in 2021; the share of agriculture, forestry and fishing sector was 1.8%, the share of industry sector was 20.0%, the share of construction sector was 5.5% and the share of services sector was 72.7%[8].

Graph 9- GROSS DOMESTIC PRODUCT IAT CURRENT PRICES BY KIND OF ECONOMIC ACTIVITY (A21) (%)
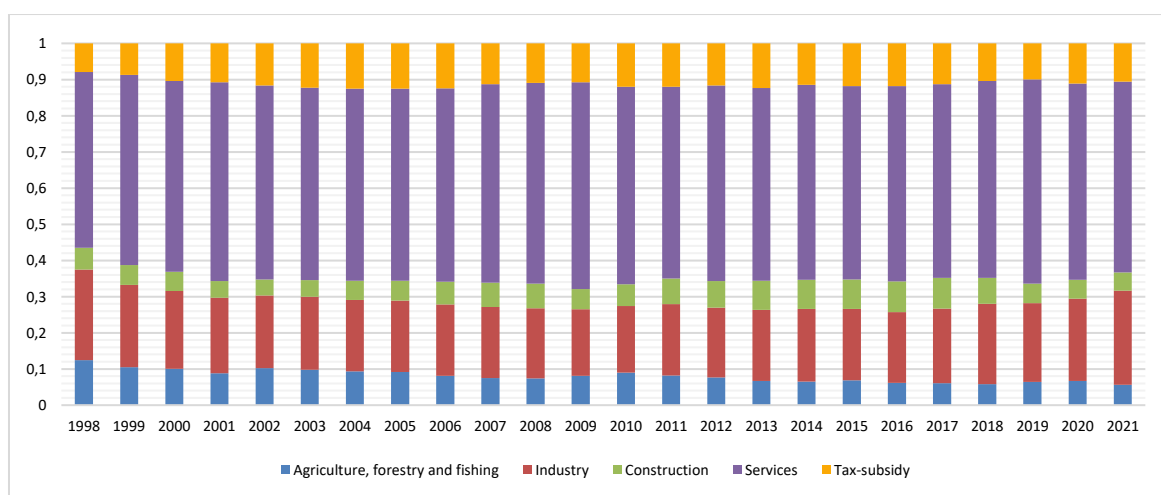
Source: TURKSTAT,2023 Notes:
1) Figures may not sum to the total due to rounding.
2) NACE Rev2 was used in Economic Activity Classification.

2.4- Environmental Protection Expenditures

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Total environmental expenditures are directly related to the environmental performance and economic welfare levels of countries. Environmental expenditures appear as a response indicator for the protection of environmental values.

Environmental protection expenditures increased by 59.2% in 2021 compared to the previous year and totaled 66.3 billion TL. Financial and non-financial corporations accounted for 64.3% of environmental protection expenditures, general government and nonprofit organizations serving households accounted for 28.3%, and households accounted for 7.3%. 58.5% of environmental protection expenditures were on waste management services, 27% on wastewater management services, 4.2% on protection of biodiversity and landscape, 3% on protection and improvement of the quality of soil, groundwater and surface water and 3.8% on other environmental protection expenditures[9].

In EU-27 countries, the ratio of total private and public expenditures on environmental protection to gross domestic product was 2.0% in 2022[10].

Graph 10- ENVIRONMENTAL PROTECTION EXPENDITURES BY DOMAINS, (2013-2021)
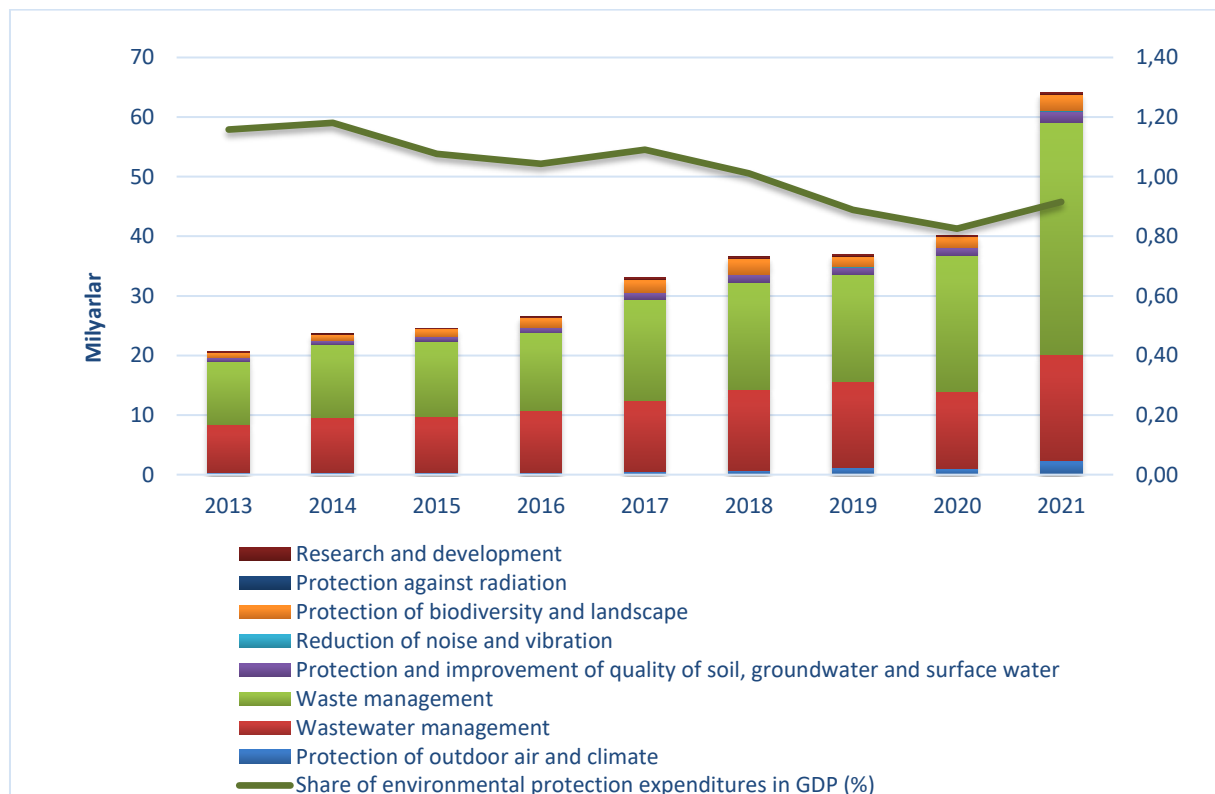
Source: TURKSTAT, "Environment Protection Expenditure Statistics, 2021"
(1) Includes educational activities for environmental protection, activities whose expenditure cannot be divided and activities not elsewhere specified.

3

HEALTH

3.1- Life Expectancy at Birth

Life expectancy at birth is an indicator of the socio-economic status and quality of life of countries and is used to compare the mortality levels of countries and to measure their level of development. This indicator varies according to socio-economic conditions and living conditions as well as the effectiveness of health services. Life expectancy is generally higher in developed countries. Women generally have higher life expectancy than men.

According to TURKSTAT data, life expectancy at birth in Turkiye was 78 years in the period 2013-2015 and 77.7 years in the period 2019-2021. According to TURKSTAT data, in the period 2019-2021, life expectancy at birth is 75 years for men and 80.5 years for women. In general, women live longer than men and the difference in life expectancy at birth is 5.5 years[11]. According to 2019 data, the countries with the highest life expectancy at birth are Hong Kong (85 years), Japan (84 years) and Switzerland (83 years). According to TURKSTAT population projections and estimates, Turkiye ranks 64th with a life expectancy at birth of 78.6 years in 2019[12].

According to 2021 data from the Statistical Office of the European Union (EUROSTAT), life expectancy at birth in EU-27 countries is 80.1 years in total, 77.2 years for men and 82.9 years for women[13].

Table 4- LIFE EXPECTANCY AT BIRTH BY SEX AND AGE (YEARS)

Period	Total	Men	Women
2013	78,0	75,3	80,7
2013-2014	78,0	75,3	80,7
2013-2015	78,0	75,3	80,7
2014-2016	78,0	75,3	80,7
2015-2017	78,0	75,3	80,8
2016-2018	78,3	75,6	81,0
2017-2019	78,6	75,9	81,3
2018-2020	78,3	75,6	81,1
2019-2021	77,7	75,0	80,5

Source: TURKSTAT, Life Tables, 2019-2021

3.2-Safe Drinking Water Access Rate

Lack of access to safe drinking water is a major cause of illness and death due to infectious agents, chemical contaminants and poor hygiene. Piped water is considered a piped water system when water is piped into the dwelling in the city water network.

According to TURKSTAT data, while 95.3% of the non-institutionalized population in Turkiye benefited from piped water systems in 2006, this rate will be 99.72% in 2022[14]. Non-institutional population refers to all individuals living in households within the borders of the Republic of Turkiye. It excludes those living in schools, dormitories, hotels, kindergartens, nursing homes, hospitals and prisons, and those living in barracks and army houses. The share of the world's population with access to an improved water source increased from 86% in 2005 to 91% in 2015.

Graph 11- NON-CORPORATE POPULATION RATE ACCORDING TO BEING OWNERSHIP OF THE PIPED WATER SYSTEM (2006-2022)
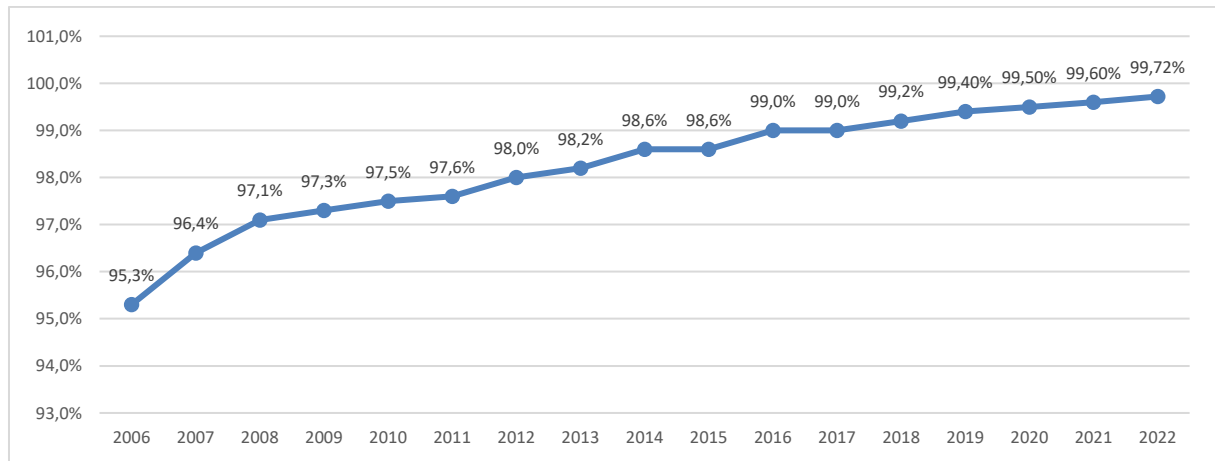
Source: ''Income and Living Conditions Survey, 2022'', TURKSTAT 2023

4
CLIMATE CHANGE

4.1- Greenhouse Gas Emissions

Greenhouse gas emissions, the country's contribution to climate change and the distribution of this contribution by sources are important for monitoring and controlling emissions and are an indicator of pressure.

Total greenhouse gas emissions in CO_2 equivalent in 2021 increased by 157.1% compared to 1990. According to the results of the greenhouse gas inventory, total greenhouse gas emissions in 2021 increased by 7.7% compared to the previous year and were calculated as 564.4 million tons (Mt) CO_2 equivalent (equivalent). Total greenhouse gas emissions per capita in Turkiye were 4 tons CO_2 equivalent in 1990, 6.3 tons CO_2 equivalent in 2020 and 6.7 tons CO_2 equivalent in 2021[15].

In 2021, greenhouse gas emissions in the EU-27 decreased by 33% compared to 1990 levels[16]. By 2021, in CO_2 equivalent, EU-27 emissions per capita are 7.9 tons/person[17].

Graph 12- CHANGE IN GREENHOUSE GAS EMISSIONS BY YEARS
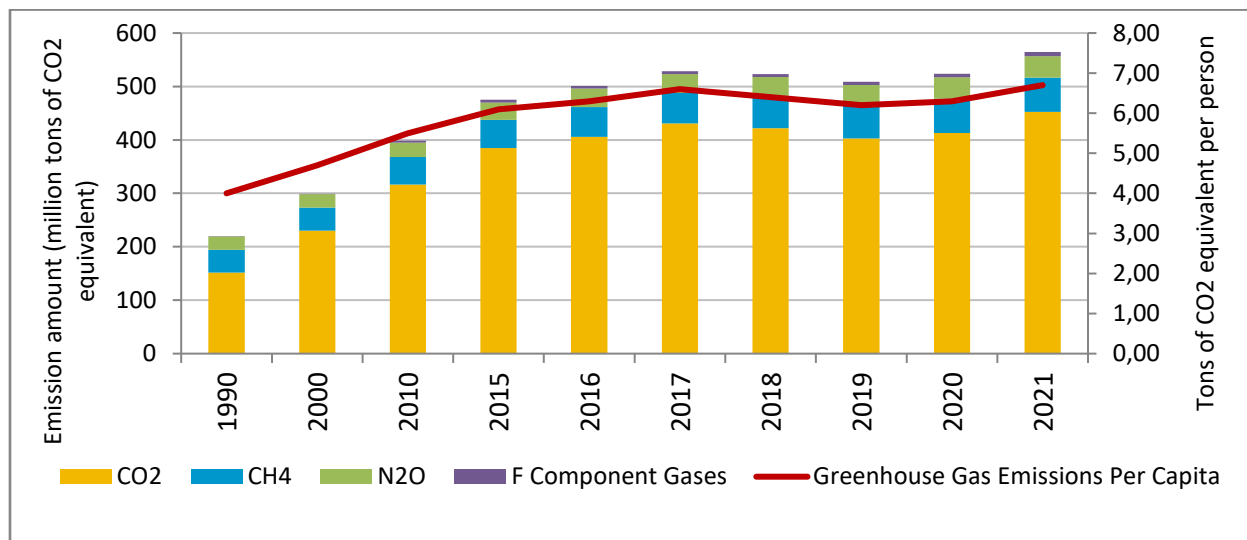
Source: TURKSTAT, Greenhouse Gas Emission Statistics, 1990 - 2021

Table 5- CHANGE IN GREENHOUSE GAS EMISSIONS BY YEARS (million tons CO_2 equivalent)

	1990	2000	2010	2015	2016	2017	2018	2019	2020	2021
CO_2	151,6	229,9	316,2	384,9	406,0	430,9	422,1	402,7	412,9	452,7
CH4	42,5	43,7	51,6	52,8	55,6	56,8	60,4	63,2	63,9	64,0
N2O	25,0	24,8	27,4	32,3	34,3	35,4	35,5	37,0	40,5	40,3
F Component Gases	0,5	0,5	3,5	5,0	5,2	5,4	5,2	5,8	67	7,4
Total	219,5	298,9	398,8	475,0	501,1	528,6	523,1	508,7	524,0	564,4

Source: TURKSTAT, Greenhouse Gas Emission Statistics,1990 – 2021
Notes:
1) Data for 1990-2020 in the table have been revised.
2) Emissions and emissions from forestry and other land use are not included.

4.2- Total Greenhouse Gas Emissions by Sector

Looking at the sectoral distribution of greenhouse gas emissions in Turkiye over the years, it is seen that the increase in total emissions is mainly due to energy production and consumption. In 2021, the largest share in total GHG emissions in terms of CO_2 equivalent was energy-related emissions with 71.3%, followed by industrial processes and product use with 13.3%, agriculture with 12.8% and waste sector with 2.6%. Energy sector emissions in 2020 are estimated to be 402.5 Mt CO_2 equivalent, industrial processes and product use emissions 75.1 Mt CO_2 equivalent, agriculture sector emissions 72.1 Mt CO_2 equivalent. Waste emissions were calculated as 14.7 Mt CO_2 equivalent[18].

In 2021, the activity with the highest GHG emissions among EU-27 GHG emissions is manufacturing, representing 22% of total greenhouse gasesemitted, followed by households at 21% and heating at 20%[19].

Graph 13- TOTAL GREENHOUSE GAS EMISSION DISTRIBUTION BY SECTORS OVER THE YEARS
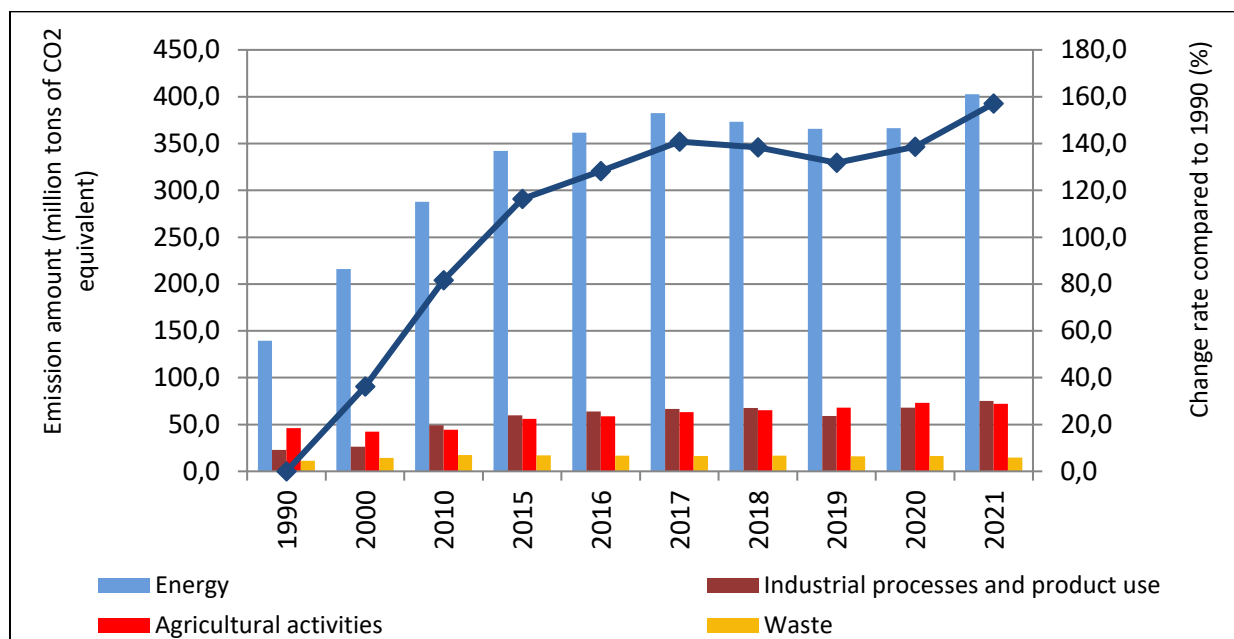
Source: TURKSTAT, Greenhouse Gas Emission Statistics, 1990 – 2021

Table 6- TOTAL GREENHOUSE GAS EMISSION DISTRIBUTION BY SECTORS OVER THE YEARS

(million tons $_{CO_2}$ equivalent)

Years	1990	2000	2010	2015	2016	2017	2018	2019	2020	2021
Energy	139,5	216,0	287,9	342,0	361,7	382,4	373,4	365,6	366,6	402,5
Industrial processes and product use	22,9	26,2	49,1	59,7	63,8	66,6	67,7	59,0	68,0	75,1
Agricultural activities	46,1	42,3	44,4	56,1	58,9	63,3	65,3	68,0	73,2	72,1
Waste	11,1	14,3	17,4	17,1	16,7	16,3	16,6	16,1	16,3	14,7
Change compared to 1990 (%)		36,2	81,7	116,4	128,3	140,8	138,3	131,7	138,7	157,1

Source: TURKSTAT, Greenhouse Gas Emission Statistics, 1990 - 2021
Notes (1) 1990-2020 data in the table have been revised.
    (2) Emissions and sinks from forestry and other land use are not included.

4.3- Carbon Sinks and Capture

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CO_2 in the atmosphere can accumulate in the biomass of vegetation and soil as carbon through photosynthesis in terrestrial ecosystems. Under the United Nations Framework Convention on Climate Change, any process, activity or mechanism that removes greenhouse gases from the atmosphere and retains them is called a sink. Sustainable forest management, afforestation, increasing forest area, conversion of degraded forests into productive forests (rehabilitation/restoration), forest maintenance (silviculture) activities, effective forest protection and forest fire management activities of the General Directorate of Forestry are activities that increase the sink potential of forests and reduce greenhouse gases. The results of these activities are reflected in the annual amount of CO_2 removed from the atmosphere and captured by the forestry sector in the Land Use, Land Use Changes and Forestry (LULUCF) section of the National Greenhouse Gas Inventory Report reported to the Secretariat of the United Nations Framework Convention on Climate Change. In addition, CO_2 captured in the category of processed forest products in the LULUCF section of the National Greenhouse Gas Inventory Report is also a forestry-related sink mechanism.

According to the data of the LULUCF section of the National Greenhouse Gas Inventory 2023 Report, the annual Carbon captures capacity of Turkiye's forests is given below:

•In 2021, around 33.9 million tons of CO_2 equivalent were sequestered in forest areas of around 23 million hectares. The 2021 value of 564 million tons of CO_2 equivalent means that the country has reduced 6% of its emissions by sequestering. In addition, 15.7 million tons of CO_2 equivalent was sequestered in 2021 in our processed wood products (timber, particleboard, etc.). In 2021, mega forest fires caused 10 million tons of CO_2 equivalent emissions in the forest areas category. Therefore, there was a decrease in sequestration
• 2.4 million tons of CO_2 equivalent emissions from land uses other than forest areas (croplands, pastures, wetlands, settlements and other land uses) in the LULUCF sector.
• Accounting for the above figures, the LULUCF sector in total sequestered 47 million tons of CO_2 equivalent in 2021. This amount means that the LULUCF sector reduced 8% of the country's emissions by sequestering forests and wood products, reducing total national emissions from 564 million tons to 517 million tons of CO_2 equivalent.
• Attitude trends in the LULUCF sector in 2021 show a decrease of 29% compared to 1990 data [20,21].

*Graph 14- CARBON SINK AREAS AND CARBON CAPTURE*S*IN TURKIYE (1990-2021) (CO2 equivalent Mt/year)*
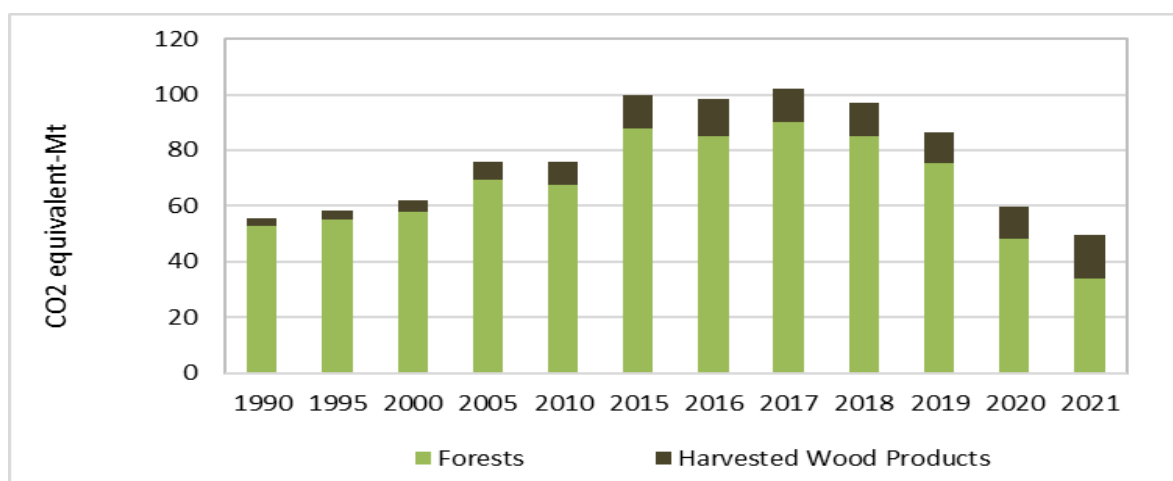
Source: Turkiye National Greenhouse Gas Inventory and Report (NIR), LULUCF Department, 2023, (https://unfccc.int/documents/627786)

Table 7- CARBON SINK AREAS AND CARBON CAPTURESIN TURKIYE (1990-2021) (CO2 equivalent Mt/year)

Years	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Forests	63.60	65.30	64,37	66,59	65,87	62,93	62,37	65,32	60,18	53,99	48,22	33,94
Harvested Wood Products	2,9	3,36	4,33	6,28	8,59	12,54	13,1	12,13	11,97	11,22	11,28	15,72

Source: Turkiye National Greenhouse Gas Inventory and Report (NIR), LULUCF Department, 2023, (https://unfccc.int/documents/627786)

4.4- Consumption of Ozone Depleting Substances (ODS)

The indicator is a driving force indicator. The ozone layer, the depletion of which would seriously harm human health, is located in the stratosphere between 15 km and 30 km above the ground and protects us and other living things from the sun's harmful ultraviolet (UV) rays. Ozone depletion can have serious impacts on human health and the environment. However, the release of Ozone Depleting Substances into the atmosphere depletes the ozone layer.

Chlorofluorocarbon (CFC,) Hydrochlorofluorocarbon (HCFC), Halon, Carbon Tetrachloride, Methyl Chloroform group gases are ozone depleting substances and are used in areas that occupy a large place in our daily lives such as refrigerators, air conditioners and fire extinguishers.

Turkiye became a party to the Montreal Protocol on Substances that Deplete the Ozone Layer (ODS) in 1991 and has ratified all its amendments. Turkiye ratified the Kigali Amendment in November 2021 as an A-5 (developing) country. Turkiye has successfully completed the necessary legislative preparations for the phase-out of ODS by January 1, 2025. The use of ozone depleting substances in Turkiye decreased by 99.5% in the period 2009-2022. Projects and activities are underway to transition to ODS alternatives[22].

Graph 15- CONSUMPTION OF OZONE DEPLETING SUBSTANCES (ODS) IN TURKIYE
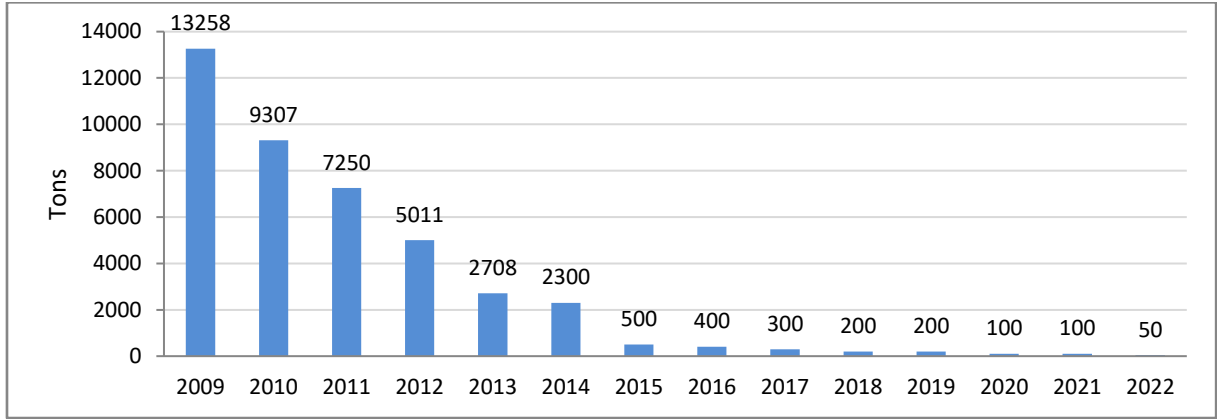
Source: Ministry of Environment, Urbanization and Climate Change, Climate Change Directorate, 2023

4.5- Precipitation

The indicator is a time series expression of average rainfall per unit area and is an impact indicator.

The areal precipitation of our country in 2022 was 503.8 mm (January 1-December 31). The average annual areal precipitation in Turkiye is 573.4 mm (1991-2020). There was a 12.1% decrease in precipitation compared to normal and 4.0% decrease compared to last year's precipitation.

Uzun yıllar ortalamalarına göre ülkemizde en yüksek yağışlar Doğu Karadeniz Bölgesi Rize ve Artvin kıyılarında 1600 mm üzerinde gerçekleşirken, en düşük yağışlar İç Anadolu'nun orta kesimleri ile Şanlıurfa, Ağrı ve Iğdır çevrelerinde gözlenmektedir.

2008 was the driest year since 1930 (444.9 mm). Annual precipitation across the country has been below normal for the last 3 years. In 2022, the Western Black Sea and Eastern Black Sea coastal areas and the east of Antalya received over 1000 mm of precipitation, while precipitation around Rize and Artvin exceeded 1600 mm. The eastern part of Iğdır received less than 200 mm of precipitation.

In province-wide precipitation, the lowest precipitation was realized in Iğdır with 253.8 mm, the highest precipitation was realized in Rize with 1624.1 mm, the highest decrease compared to normal was realized in İzmir with 34% and the highest increase was realized in Samsun with 21.8%.

In 2022, precipitation decreased by more than 40% compared to normal in the north of İzmir, Bursa, Şanlıurfa, Mardin and the eastern parts of Iğdır, Ağrı and Van, and increased by 40-60% in the eastern parts of Sinop, Samsun, Ordu, Giresun and Mersin[23].

Graph 16- TURKIYE-WIDE ANNUAL AREAL PRECIPITATION (mm)
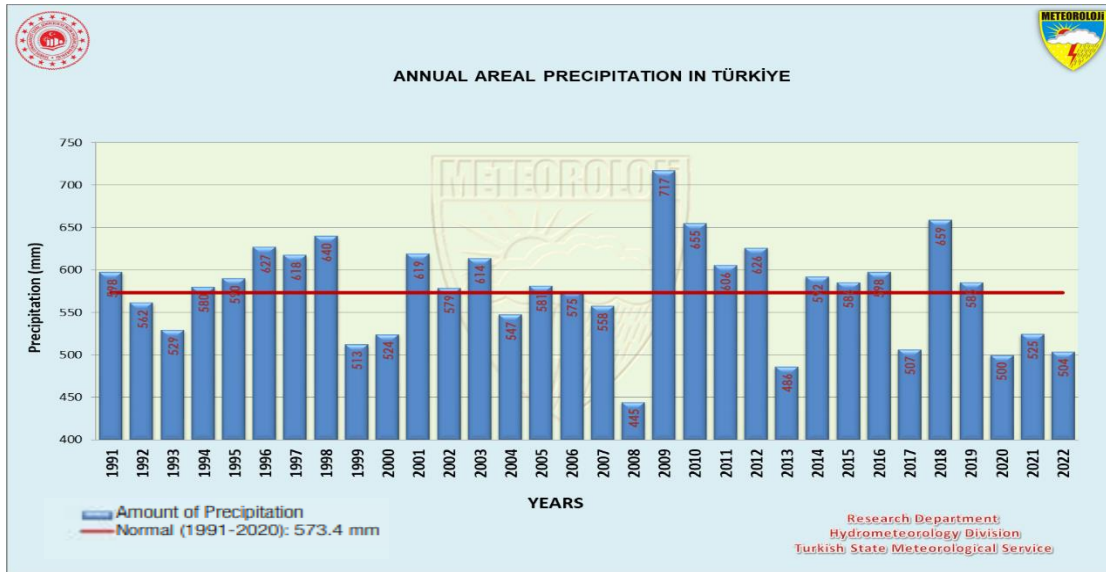
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology; 2023

According to the drought analysis conducted for Turkiye between 1981 and 2022 using the Standard Precipitation Index (SPI) method, the number of dry years in these 42 years is 13. 2008 is the driest year and this year was exceptionally dry. 15 years were normal and 14 years were humid. 2009 was the wettest year and was exceptionally humid. 2022 was moderately dry[24].

Graph 17-DROUGHT SITUATION IN TURKIYE BETWEEN 1981 AND 2022
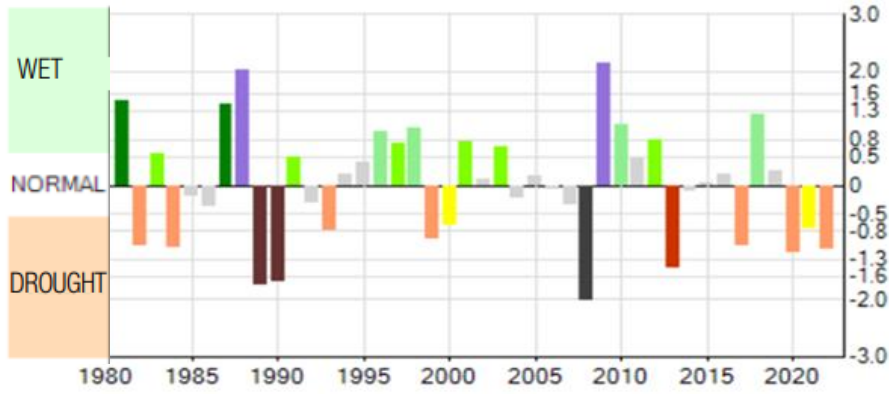
	Sayı	Yüzde
Exceptionally wet	2	%4,76
Extremely wet	0	%0,00
Very wet	2	%4,76
Moderately wet	4	%9,52
Mildy wet	6	%14,29
Normal	15	%35,71
Mild drought	2	%4,76
Moderate drought	7	%16,67
Severe drought	1	%2,38
Extreme drought	2	%4,76
Exceptional drought	1	%2,38
	0	%0,00

Chosen Period (Start-End Date)
12- Month (January-December)

The total number of years analyzed: : 42

The first year of observation: 1981

The driest year: 2008

Number of dry years: 13

Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology; 2023

4.6- Temperature

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The indicator shows the annual average temperature change in Turkiye and the world and is a status indicator.

In 2022, the global average temperature of oceans and land was 14.7 °C, 0.2 °C above the 1991-2020 average of 14.5 °C. In 2022, the average temperature in Turkiye was 14.5 °C, 0.6 °C above the 1991-2020 average of 13.9 °C. In 2022, the lowest temperature was -34.4 °C in Özalp in January and the highest temperature was 47.4 °C in Cizre in August.

Looking at the 1971-2022 period, the highest annual average temperature in Turkiye was 15.5 °C in 2010 and the lowest annual average temperature was 11.7 °C in 1992. There have been positive temperature anomalies in Turkiye's average temperatures since 2007 (except 2011)[25].

Graph 18- AVERAGE ANNUAL TEMPERATURES IN THE WORLD AND TURKIYE

Annual Mean Temparature in the World and Türkiye

Turkey Mean Temperature — World Mean Temperature
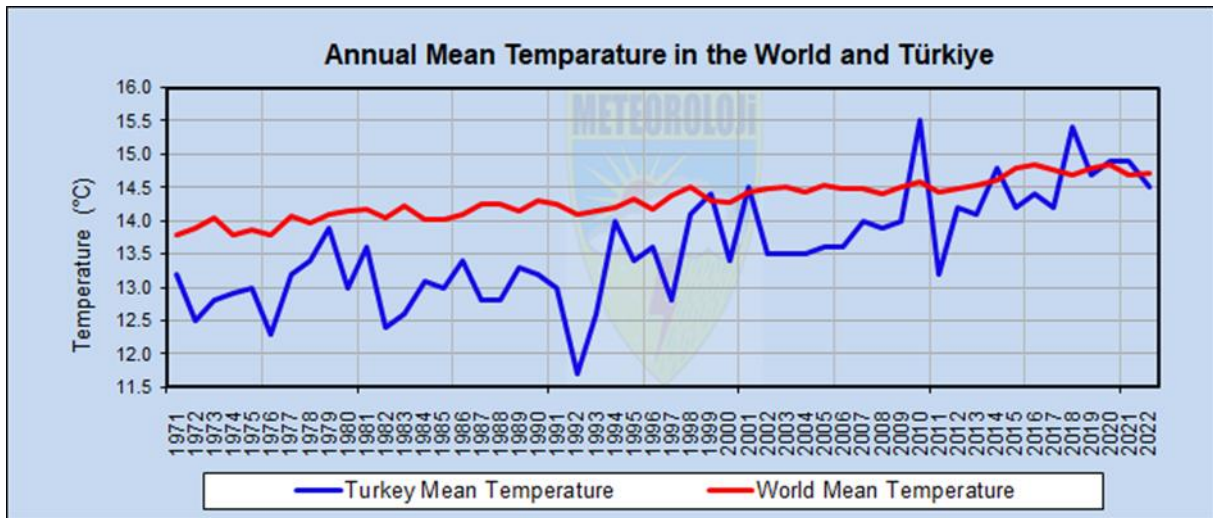
Sources:
For worldwide data; US Department of Commerce National Oceanic and Atmospheric Administration (NOAA), 2023
For Turkiye data; Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology, 2023

Map 1- Number of Frosty Days in Turkiye
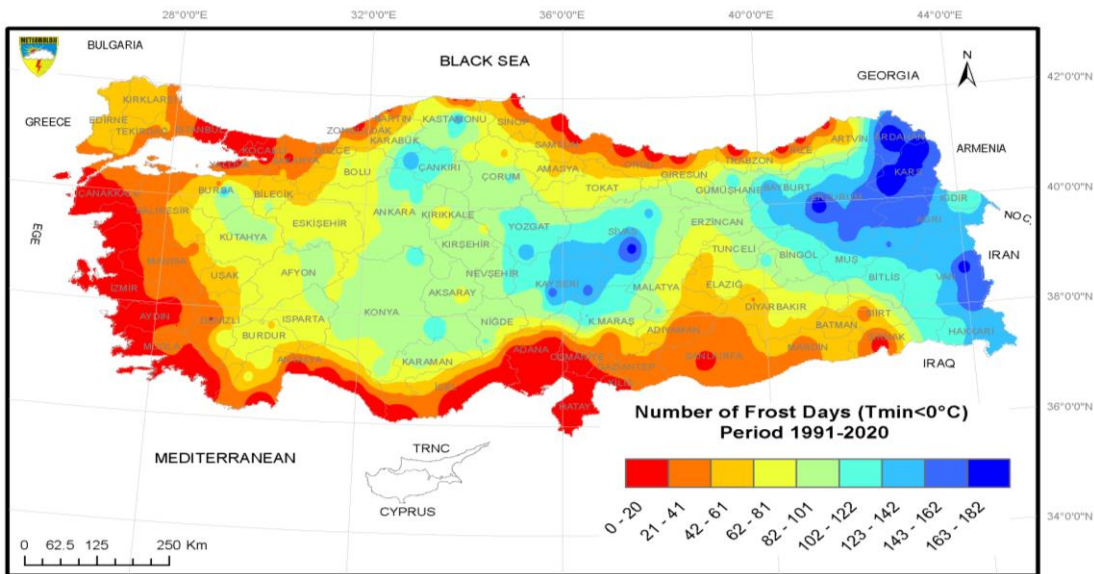
Number of Frost Days (Tmin<0°C)
Period 1991-2020

Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology, 2023

According to 1991-2020 climate normals, the number of frosty days in Turkiye is 0-22 days in coastal areas and over 163 days in Kars, Ardahan, Erzurum, Sivas and Van.

Map 2- Trend in Number of Frosty Days
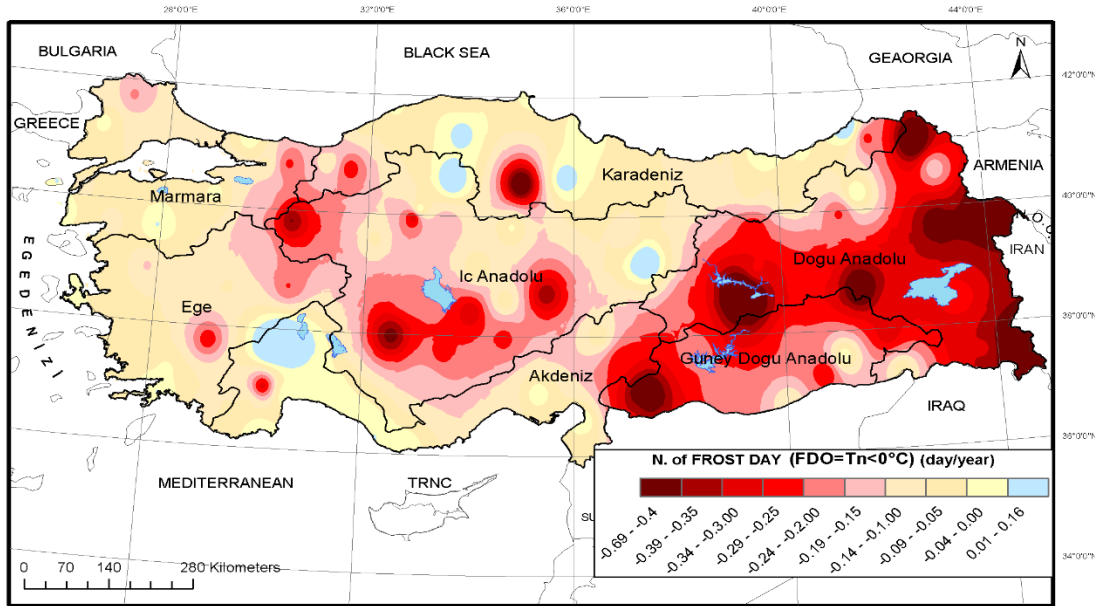
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology, 2023

In the analysis made using 1960-2020 data, it is calculated that the number of frosty days in Turkiye has a significant decreasing trend in the eastern and inland parts of the country. There is a slight increase around Isparta, Burdur, Hopa, Kangal, Çankırı, Amasya and Kastamonu.

4.7- Sea Surface Temperature

The indicator refers to the annual change in seawater surface temperature and is an impact indicator.

The main source of weather events and air masses in the atmosphere is the oceans and seas. The most accurate indicator of climate change is the warming and cooling of sea water. The warming or cooling of seawater changes the ecological structure of the seas and affects many living things, as well as closely affecting an important segment of the population that economically benefits from the seas.

Sea water temperature is a meteorological parameter that is not instantly affected by atmospheric warming and cooling as in air temperature, warms up and cools down later than land, and therefore its temperature does not change very suddenly during the day. The most important factors affecting sea water temperature are latitude, salinity, cold water currents and the direction of the wind blowing during the day.

According to the data of the General Directorate of Meteorology, although there is a slight upward trend in the long-term average sea water temperatures in Turkiye, it is not correct to talk about global warming at this stage. In order to monitor this process, the General Directorate of Meteorology continues to carry out sea water temperature measurements in a way to cover all our seas. This will provide a higher resolution data source for our seas.

In 2022, the average sea water temperatures were 20.2°C in the Mediterranean Sea, 19.6°C in the Aegean Sea, 17.8°C in the Sea of Marmara and 16.3°C in the Black Sea. Annual average sea water temperatures (°C) measured in the seas between 1970 and 2022 are given in the following graphs[26]

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Graph 19- ANNUAL MEAN SEA SURFACE TEMPERATURES MEASURED IN THE MEDITERRANEAN SEA (°C))
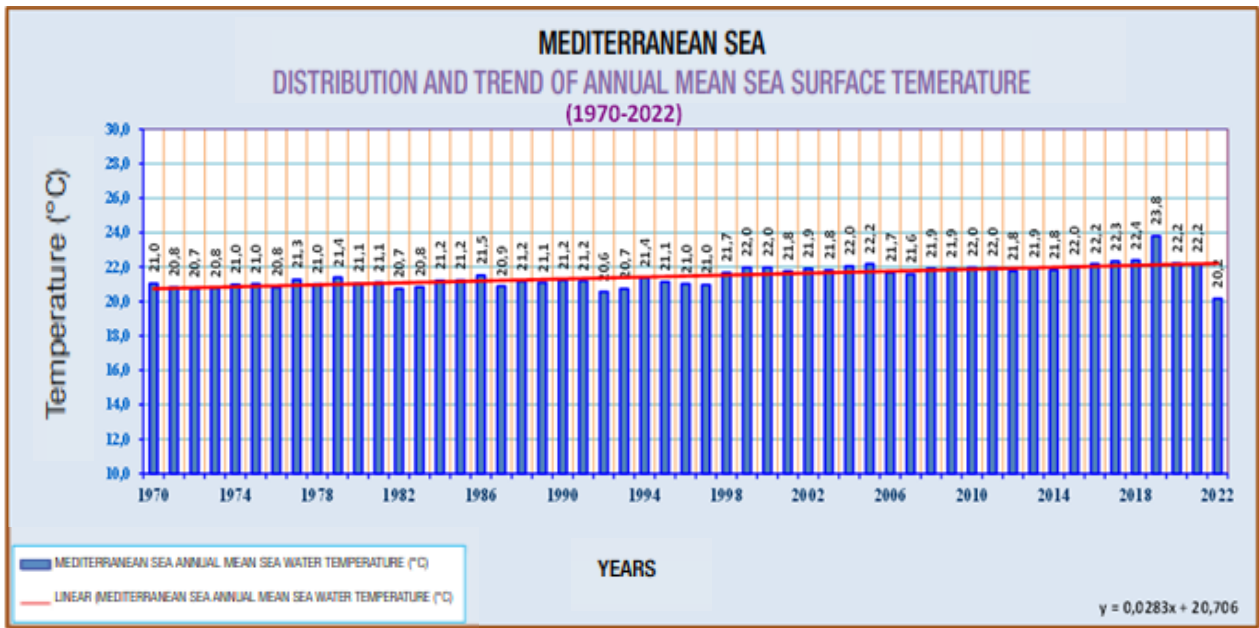
Graph 20- ANNUAL MEAN SEA SURFACETEMPERATURES MEASURED IN THE AEGEAN SEA (°C)
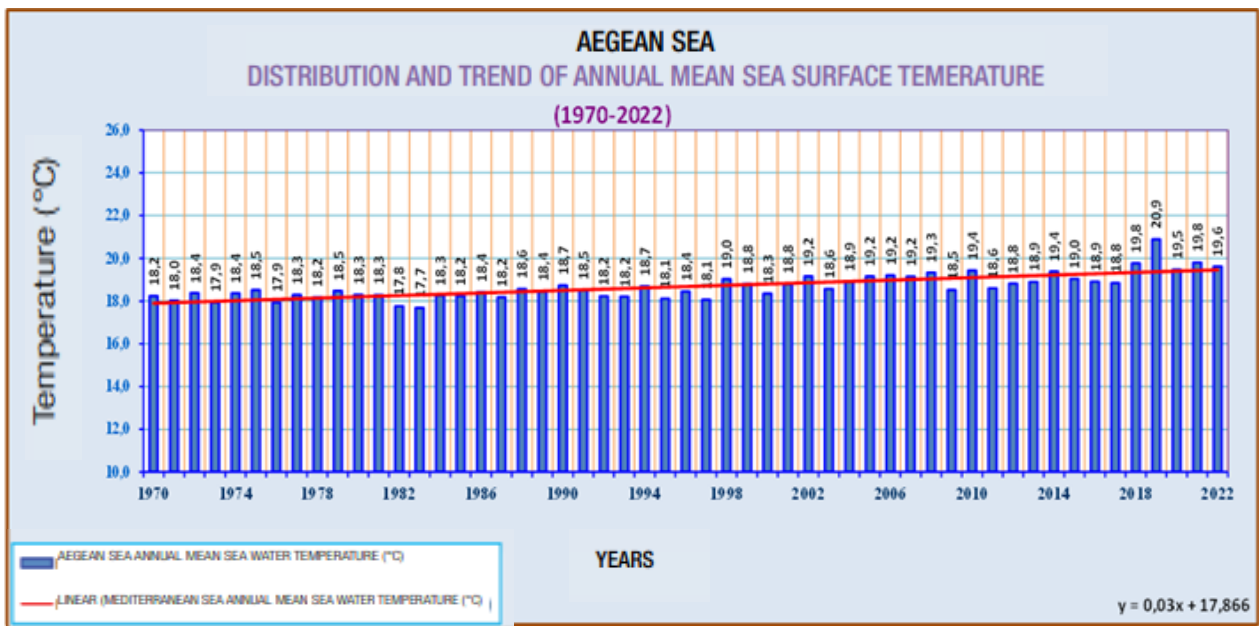
Graph 21- ANNUAL MEAN SEA SURFACE TEMPERATURES MEASURED IN THE BLACK SEA (°C)
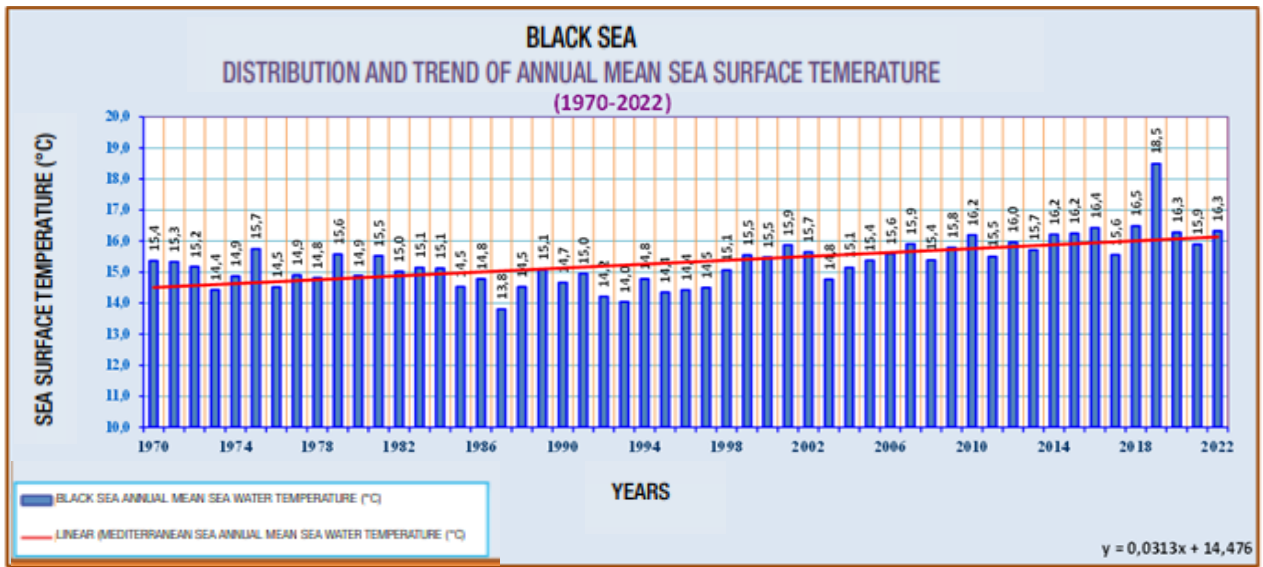
Graph 22- ANNUAL MEAN SEA SURFACE TEMPERATURES MEASURED IN THE MARMARA SEA (°C)
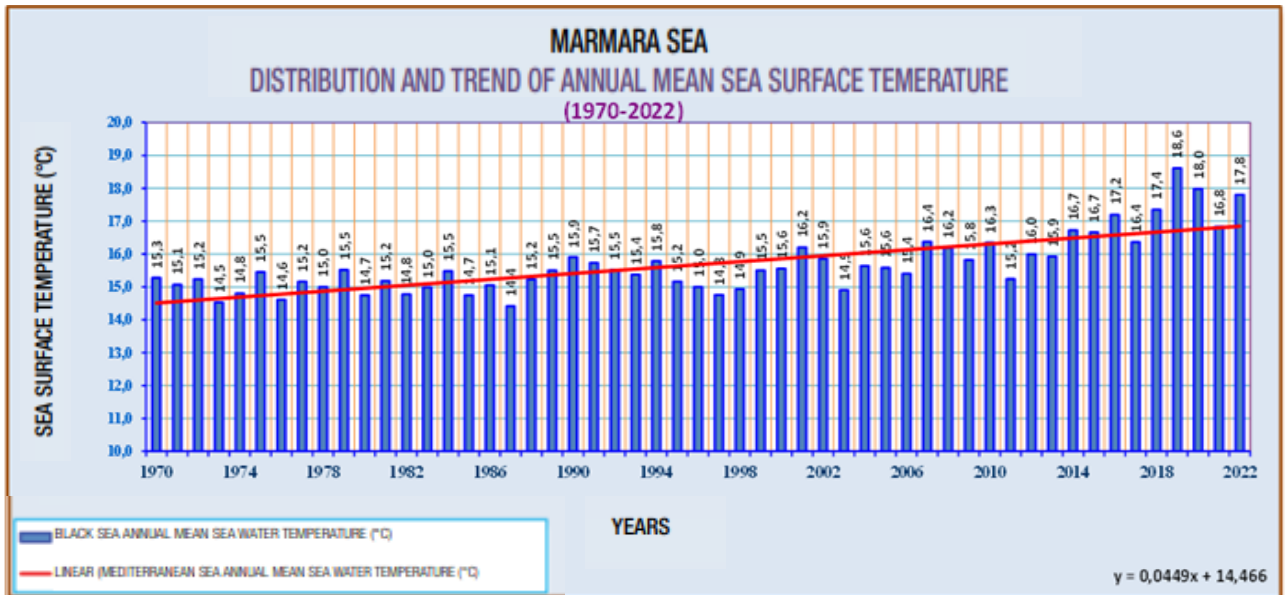
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology, 2023

4.8- Heating and Cooling Day-Degrees

Knowing the sum of heating or cooling day degrees is important for knowing the energy requirement for heating or cooling of buildings and is an indicator of impact. Heating is unnecessary if the outdoor temperature is above 15°C. The cost of heating is directly proportional to the annual Heating Degree Days (HDD). HDD is also used to compare the relative harshness of the winter season to previous and longer years.

When heating and cooling day-degrees are evaluated in Turkiye; Heating Day-Degrees for 1991-2020 normals in 220 centers in Turkiye are 2191 Day-Degrees on average, while Cooling Day-Degrees are 325 Day-Degrees[27].

Map 3- TURKIYE 1991-2020 AVERAGE HEATING DAYS-DEGREES
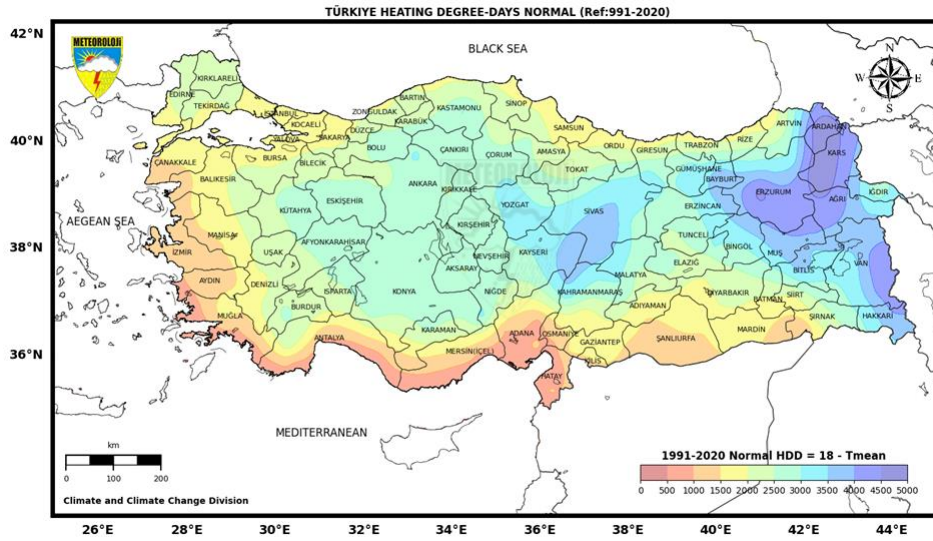
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology; 2023

Map 4- HEATING DAY-DEGREES IN TURKIYE IN 2022
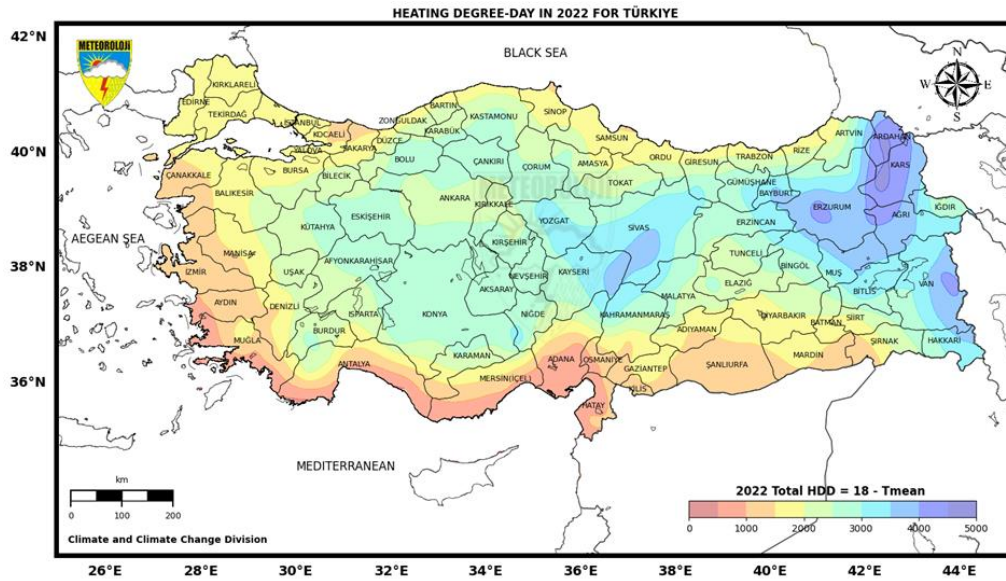
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology; 2023

In 220 centers in Turkiye, average heating day-degrees in 2022 were 2060 day-degrees, while cooling day-degrees were 382 day-degrees[28].

Map 5- TURKIYE 1991-2020 AVARAGEL COOLING DAYS-DEGREES
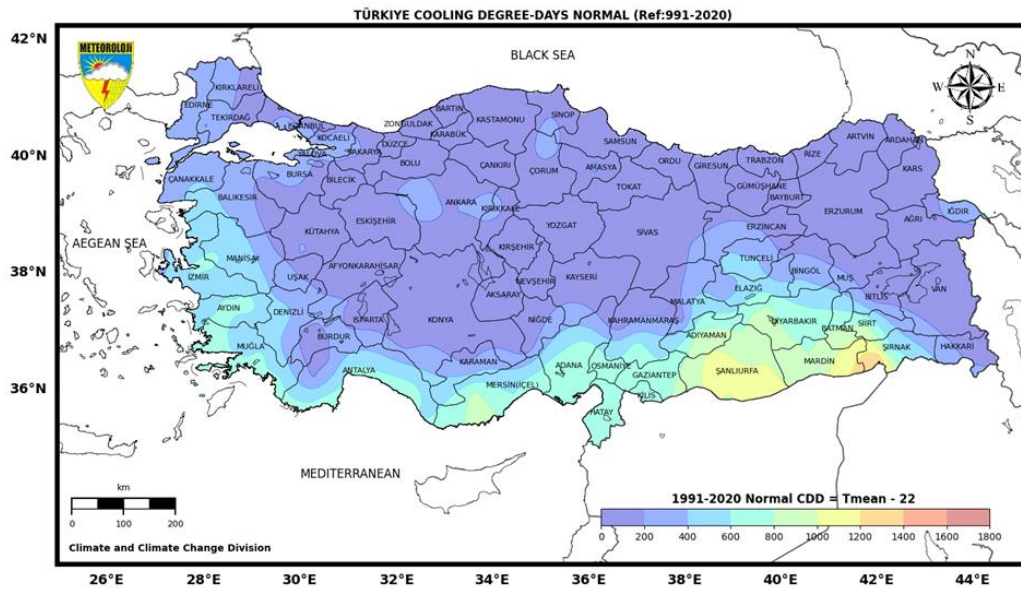
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology, 2023

Map 6- TURKIYE COOLING DAYS-DEGREES IN 2022
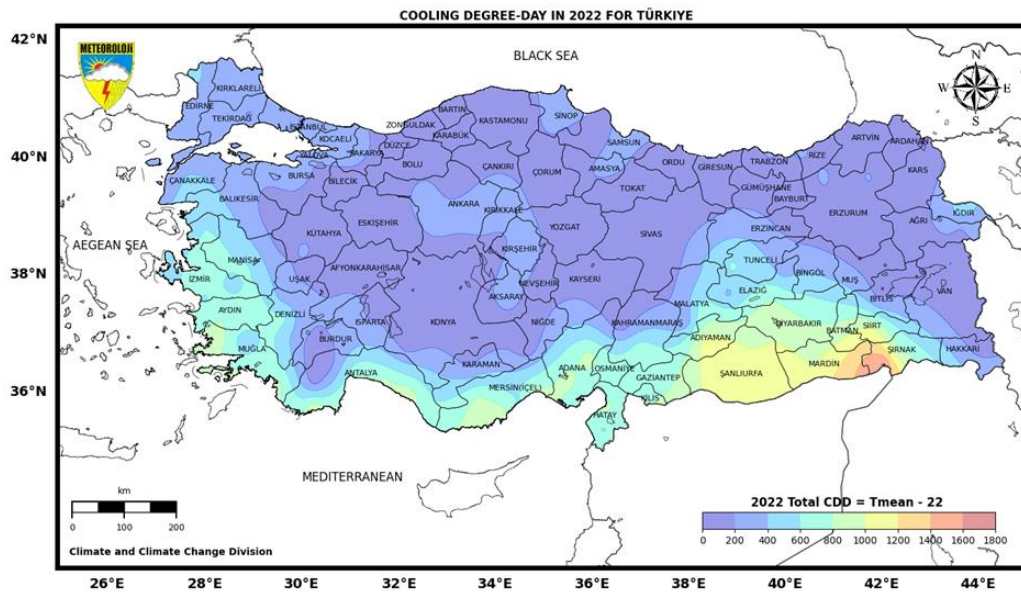
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology, 2023

4.9. Number of Storm Disasters

This indicator shows the change in the number of storm disasters that occurred in Turkiye between 1981 and 2022 according to the records of the General Directorate of Meteorology and is an impact indicator.

Storm disasters are a type of disaster that can be observed in almost all of Turkiye. There has been an increasing trend in the number of storm disasters in Turkiye, especially since the 2000s. The highest number of storm disasters was recorded in 2021, 2016 and 2010. 2021 was recorded as the year with the highest number of storm disasters[29].

Graph 23-1981-2022 DISTRIBUTION OF TOTAL STORM DISASTERS IN TURKIYE BY YEARS
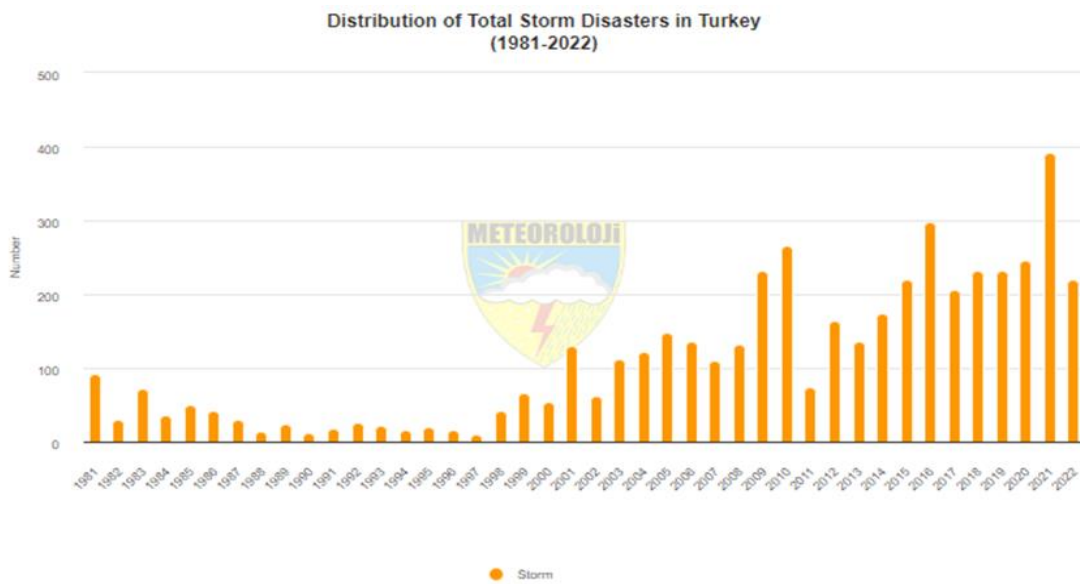
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology, 20

5

AIR POLLUTION

5.1. Air Pollutant Emissions

P D E T

Air pollutant emissions are an important pressure indicator affecting air pollution. It includes national emissions of major air pollutants by year and source sector.

The work under the United Nations Economic Commission for Europe (UN-ECE) "Convention on Long-Range Transboundary Air Pollution (CLRTAP)" and the related Protocol "Long Term Financing of the *co-operative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe* (EMEP)" is carried out by the Ministry of Environment, Urbanization and Climate Change.

A national air pollutant emission inventory is prepared annually and reported through the European Environment Information and Observation Network (EIONET) together with the UN-ECE Secretariat. The first reporting was realized in 2011 and improvements are implemented annually. Emission calculations are made using emission factors taken from internationally recognized guidance documents.

The United Nations Convention on Long-Range Transboundary Air Pollution (CLRTAP) entered into force on 13.11.1979 and became a party to the convention on 18.04.1983. There are 51 parties to the convention and the secretariat of the convention is run by UN-ECE.

The Convention has 8 protocols. The only protocol to which Turkiye became a party on 20.12.1985 is the "Protocol on Long Term Financing of the *co-operative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe* (EMEP)". With this protocol, it is aimed to collect air pollutant emission inventories of all parties, to model the inventory data for the EMEP region and to verify the model results with air quality measurements at long-range stations. Within this framework, the Ministry of Environment, Urbanization and Climate Change is carrying out the necessary works and procedures operationally based on air quality management.

The bodies of the Convention are the executive body, the EMEP monitoring body, the implementation committee, the impacts working group and the strategies working group. These bodies hold regular meetings within the framework of an annual work plan. Under the EMEP monitoring body, there are 4 centers and 3 task forces. The main purpose of the task forces is to provide scientific and technical support to the convention and protocol. The following activities were carried out under the Convention on Long-Range Transboundary Air Pollution:

- Within the framework of our responsibilities under the EMEP protocol, emission inventory reporting has been carried out regularly in time series since 2011, starting 2 years behind the current calendar year according to the rules.

- The Informative Inventory Report (IIR), which should be prepared within the scope of emission inventory data, is sent annually for the first time in 2012.

- The 2013 ordinary meeting of the Task Force on Emission Inventories and Projections was hosted by Turkiye in Istanbul. At this meeting, our reporting was awarded the "Best Developed Inventory in the Last Three Years" award. At the 2015 ordinary meeting, our Inventory reporting received an award in the "Significant Progress" category.

Pollutants for reporting are NO_X (nitrogen oxides), SO_2 (sulphur dioxide), NM_{VOC} (non-methane volatile organic compounds), NH_3 (ammonia), PM_{10} (particulate matter), CO (carbon monoxide) and additions are made every year within the framework of necessary improvements.

Under the framework of the Convention and the Protocol, "Country Review" Inspections are organized for country reporting periodically according to the determined schedule, and since 2012, the reviews for our country have been carried out by the Convention Task Forces in 2012, 2016, 2019 and 2022.

When the status of emissions for the years 1990-2021 covered by the reporting based on 2021 in the graph is analyzed; it is seen that emissions have started to decrease for many pollutants.

Compared to 2020, it is understood that NM_{VOC}, CO, PM_{10}, emissions have decreased and other emission totals have increased. The time series and changes in emissions compared to the previous year are presented in Table 8[30].

In 2020 national emission totals; SO_2 emissions originated from power generation plants with 68.6% and domestic heating with 13.9%. NOX emissions originated from power generation plants with 37%, NM_{VOC} emissions from livestock sector with 21.7% and PM_{10} emissions from domestic heating with almost 40%. The most important source of NH_3 emissions is fertilizer management[31].

Table 8- EMISSION CHANGE TRENDS FOR SO₂, NOₓ, NM_{VOC}, NH₃, CO AND PM₁₀

Change throughout years (%)	SO2	NOₓ	NMVOC	NH₃	CO	PM₁₀
Trend (1990-2021)	372	643	63	51	-12	135
Trend (2020-2021)	17	2	-1	6	-7	-5

Source: Turkiye's Informative Inventory Report, 2021, Ministry of Environment, Urbanization and Climate Change, General Directorate of Environmental Management, 2023

Between 2005 and 2021, emissions of four of these pollutants decreased by 80% for SOx, 47% for NOₓ, and 29% for NM_{VOC} in EU-27 member states[32].

Graph 24- EMISSION TOTALS FOR SO₂, NOₓ, NMVOC, NH₃, CO and PM₁₀ (1990-2021)
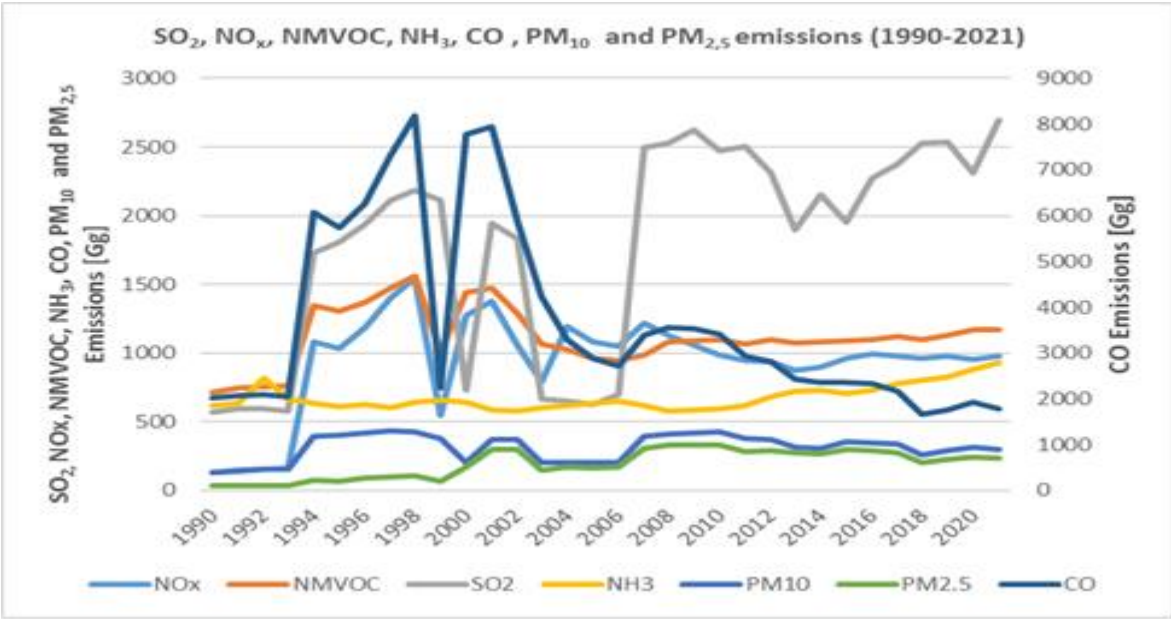
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Environmental Management, 2023

5.2- Large Combustion Plants

This indicator is an important pressure indicator affecting air pollution. Large incineration plants use large quantities of fuel, mostly fossil fuels, to produce useful forms of energy and have a rated thermal power of 50 MW or more. Emissions from large combustion plants account for a large share of total anthropogenic pollutant and greenhouse gas emissions. The aim of Legislation on this issue is to reduce emissions of acidifying pollutants, particulate matter and ozone precursors. A systematic transition to low-carbon and cleaner alternatives in energy production is needed[33]
The European Union's policies on air quality, public health and climate change have resulted in a reduction in total fuel consumption in incineration plants. It is expected to take more effective measures to meet the zero pollution and decarbonization targets under the new Green Deal and to replace fossil fuels with renewable sources[34].

Table 9- NUMBER OF LARGE COMBUSTION PLANTS AND TOTAL THERMAL POWER

Thermal Input MWth	2018		2019		2020		2021	
	QUANTITY	Thermal Input MWth	QUANTITY	Thermal Input MWth	QUANTITY	Thermal Input MWth	QUANTITY	Thermal Input MWth
50-100 mwth	58	3.172	45	2.895	46	2.662	46	2.790
100-300 mwth	33	5.422	40	6.346	41	6.546	37	5.944
300-500 mwth	30	1.253	31	12.890	35	14.425	37	15.311
>500 mwth	93	187.806.773	92	184.190.675	86	174.953.024	87	154.352.244
TOTAL	214	187.816.620	208	184.212.806	208	174.976.657	207	154.376.289

Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Environmental Management, 2023

5.3- Average Concentrations Of PM_{10} And SO_2 In Ambient Air

Concentrations of pollutants in outdoor air are a basic indicator of air pollution. For this reason, within the scope of the "National Air Quality Monitoring Network", data from air quality monitoring stations located in 81 provinces are collected and made available to the public on a continuous and online basis at www.havaizleme.gov.tr.

According to the information obtained from the National Air Quality Monitoring Network, the annual average PM_{10} and SO_2 data measured and verified at the 10 stations with the highest pollution in 2022 are presented in Table 10. Hakkari station is the highest station in 2022 in terms of annual average PM_{10} and SO2 values.

Looking at the last five-year period between 2018 and 2022, it is seen that Iğdır, Malatya and Muş stations are among the top 10 stations with the highest annual PM_{10} averages 5 times; Şırnak station 4 times; Çorum, Erzincan and Kilis stations 3 times. In the last five-year period, Edirne, Hakkari and Şanlıurfa stations were among the top 10 stations with the highest annual SO_2 averages 5 times; Bitlis, Yozgat, Tunceli and Van stations 4 times.[35].

Table 10-2022 AIR QUALITY MONITORING STATIONS WITH THE HIGHEST PM_{10} and SO_2 AVERAGES

Station Name	PM_{10} $(\mu g/m^3)$*	Station Name	SO_2 $(\mu g/m^3)$*
HAKKARİ	111	HAKKARİ	60
IĞDIR	98	ŞANLIURFA	37
ŞIRNAK	92	KAHRAMANMARAŞ	30
BATMAN	90	MARDİN	20
MUŞ	77	TUNCELİ	20
DENİZLİ	76	GAZİANTEP	20
MALATYA	75	KIRIKKALE	20
KİLİS	68	AĞRI	19
GAZİANTEP	66	EDİRNE	17
OSMANİYE	65	MANİSA	17

* Validated hourly average data from the stations are evaluated based on those with 90% and above.
MHTM: Marmara Clean Air Center
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of EIA, Permit and Inspection, Department of Laboratory, Measurement and Monitoring, 2023

Graph 25 shows the average PM_{10} concentrations of the last five years. Accordingly, in 2022, the national limit value and the European Union limit value were exceeded by 29%.

Graph 25- AVERAGE PM $_{10}$ CONCENTRATIONS FOR THE LAST FIVE YEARS (2018-2022)
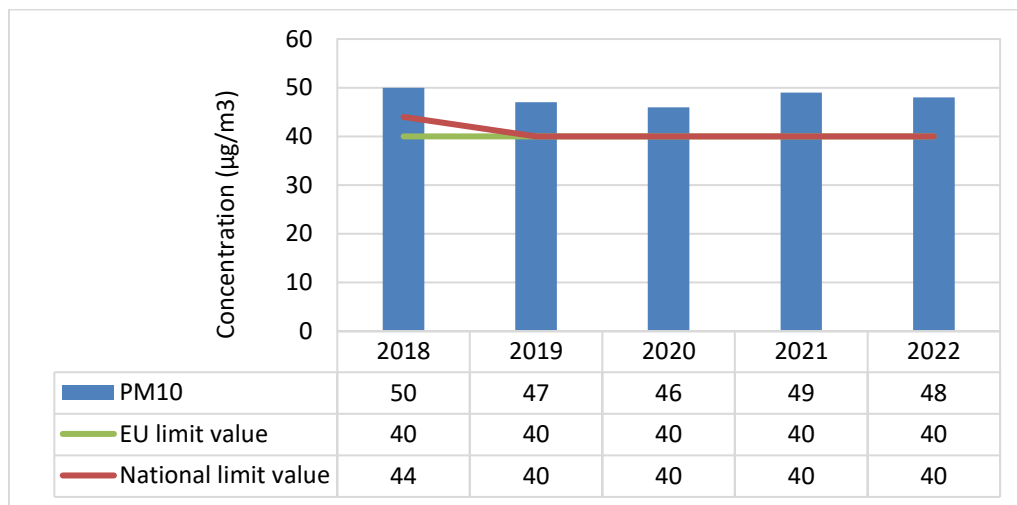
	2018	2019	2020	2021	2022
PM10	50	47	46	49	48
EU limit value	40	40	40	40	40
National limit value	44	40	40	40	40

Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of EIA, Permit and Inspection, Department of Laboratory, Measurement and Monitoring, 2023

Within the scope of "Clean Air Action Plans" to improve air quality; necessary work is being carried out and continues to be carried out to increase the effectiveness of measures to control the type of fuel used for heating, improve combustion systems, sheathing in buildings, training of igniters and reducing pollution loads from motor vehicles. Both local administrations and the Ministry of Environment, Urbanization and Climate Change and Provincial Directorates continue their efforts to control air pollution.

5.4- Number of Exceedances of Air Quality Limit Values

It is a status indicator showing how often air pollution exceeds the limit values. An increase in the number of exceedances indicates a deterioration in air quality.

In the By-Law on Air Quality Assessment and Management (BAQAM), stricter limit values have been applied for air quality parameters with gradual reduction since 2009. The fact that the limit values specified in the BAQAM are lowered a little more each year and the number of stations measured is constantly increasing plays a role in the increase in the total number of exceedances.

In 2022, the daily limit value is set as 40 µg/m^3 for PM_{10} and 125 µg/m^3 for SO_2. In 2022, the total number of exceedances is 36334 for PM_{10} parameter and 322 for SO_2 parameter[36].

5.5- Number of Air Quality Monitoring Stations

The indicator is a response indicator and tracks the number and quality of monitoring stations in order to ensure healthier air quality data.

The 365 stations in our country have been established in accordance with the European Union norms by grouping them on both source-based and area-based basis. During the establishment of the stations, the preliminary air quality assessment studies conducted by the Ministry were utilized.

Among the existing stations, PM_{10} is measured at 345 stations, $PM_{2.5}$ at 178 stations, SO_2 at 310 stations, NO_X at 307 stations, O_3 at 211 stations and CO at 195 stations[37].

According to the European Union norms, the current number of stations should be at least 350 when population data, which is a factor in determining the number of stations to be established, is taken as a reference. In this context, at the last point reached by the Ministry, the current number of stations is 365.

Graph 26- NUMBER OF AIR QUALITY MONITORING STATIONS BY YEAR
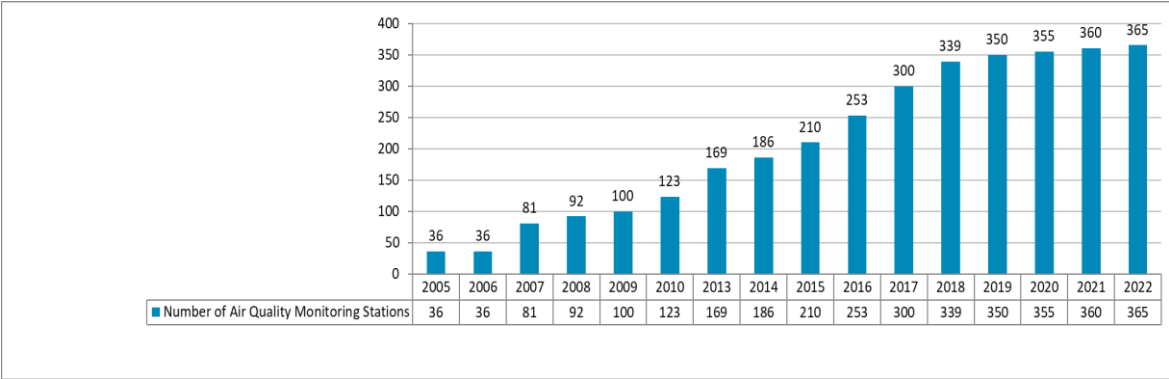
	2005	2006	2007	2008	2009	2010	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Number of Air Quality Monitoring Stations	36	36	81	92	100	123	169	186	210	253	300	339	350	355	360	365

Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of EIA, Permit and Inspection, Department of Laboratory, Measurement and Monitoring, 2023

5.6- Forest Ecosystem Exposed to Pollutants such as Ozone (O₃), Sulfur Dioxide (SO₂), Ammonia (NH₃) and Nitrogen Dioxide (NO₂)

This indicator is very important for monitoring and assessment of air quality in intensive monitoring Level II areas established to monitor the health status of forests, firstly because air pollutants can have direct negative impacts on forest trees and forest ecosystems, and secondly because knowing the concentration of pollutants in the atmosphere can facilitate the improvement of dry deposition estimates in forest areas. For this reason, the determination of the effects of ozone (O3), nitrogen dioxide (NO2), sulfur dioxide (SO_2) and ammonia (NH3) air pollutants, which have a direct effect on vegetation, on forest ecosystems and whether the component concentrations exceed the specified limit values are monitored and tried to be maintained as continuously as possible.

In 2022, 1800 samples were taken for the measurement of Sulfur dioxide (SO_2), Ammonia (NH_3), Ozone (O_3) and Nitrogen dioxide (NO_2) pollutants related to air quality in 18 intensive monitoring Level II observation areas and 1584 samples were taken in 2023. According to the results of the measurements made for 9 months covering the period from April to December in 2022 and for 7 months covering the period from June to December in 2023, the measurements of NH_3, NO_2, SO_2 and O_3 pollutants were within the lower and upper limit value range [38].

Pollutant Reasonable Value Ranges for Level II Stations according to ICP Forests program;

For O_3 the lower limit is 5 μg/m³ and the upper limit is 200 μg/m³; for SO_2 and NO_2 the lower limit is 0.2 μg/m³ and the upper limit is 40 μg/m³; for NH_3 the lower limit is 0.1 μg/m³ and the upper limit is 40 μg/m³.

6

WATER – WASTE WATER

6.1-Use of Freshwater Resources

F **P** D E T

The indicator is a pressure indicator and shows the use of freshwater resources (surface and groundwater) to meet the water needs of the drinking water, industrial and agricultural sectors. Water use is an indicator of pressure on freshwater resources.

According to DSİ data, sectoral water use for 2022 is 44 billion m³ (77%) in Irrigation, 13 billion m³ (23%) in Drinking, Utilization and Industry, total water use is 57 billion m³ [39]. Based on TURKSTAT data for other water use data, a total of 18.2 billion m³ of water was withdrawn from water resources by municipalities, villages, manufacturing industry workplaces, thermal power plants, Organized Industrial Zones (OIZ) and mining enterprises in 2020, while a total of 19.2 billion m³ of water was withdrawn in 2022. In 2022, a total of 43.2% of the water withdrawn was supplied from freshwater resources, 56.8% of which was from the sea, 22.1% from groundwater and 21.1% from surface waters. 94% of the water withdrawn from the sea was provided for cooling purposes[40].

Tablo 11- AMOUNT OF WATER ABSTRACTED FROM WATER RESOURCES BY USES (billion m³ /year)

Years	2008	2010	2012	2014	2016	2018	2020	2022
Municipalities	4,55	4,78	4,94	5,23	5,83	6,19	6,49	6,67
Villages	1,22	1,01	1,04	0,43	0,38	0,39	0,42	0,39
Manufacturing industry workplaces	1,31	1,56	1,79	2,20	2,12	2,68	2,60	2,80
Thermal power plants	4,54	4,27	6,40	6,53	8,61	7,87	8,28	8,88
Organized industrial zones	0,11	0,11	0,14	0,14	0,15	0,16	0,18	0,14
Mining operations	… (*)	0,05	0,11	0,21	0,23	0,24	0,27	0,18
Irrigation	33,77	38,15	41,55	35,85	43,06	43,95	44,0	44,0
Total		49,95	55,96	50,59	60,38	61,48	62,24	63,06

(*) No information available.

Note: TURKSTAT data includes the use of sea water.

Sources: For "Irrigation" figures, the source is the amount of surface and groundwater taken from the Ministry of Agriculture and Forestry, General Directorate of State Hydraulic Works (DSİ), http:// www.dsi.gov.tr/dsi-resmi-istatistikler.

For other data; TURKSTAT "Water and Wastewater Statistics, 2022" Newsletter

Graph 27- WATER CONSUMPTİON BY SECTOR, (2010-2022)

	2010	2012	2014	2016	2018	2020	2021	2022
■ Irrigation	76,4	74,2	70,9	71,3	71,5	76,8	77	77
■ Drinking-Usage-Industry	23,6	25,8	29,2	28,7	28,5	23,2	23	23
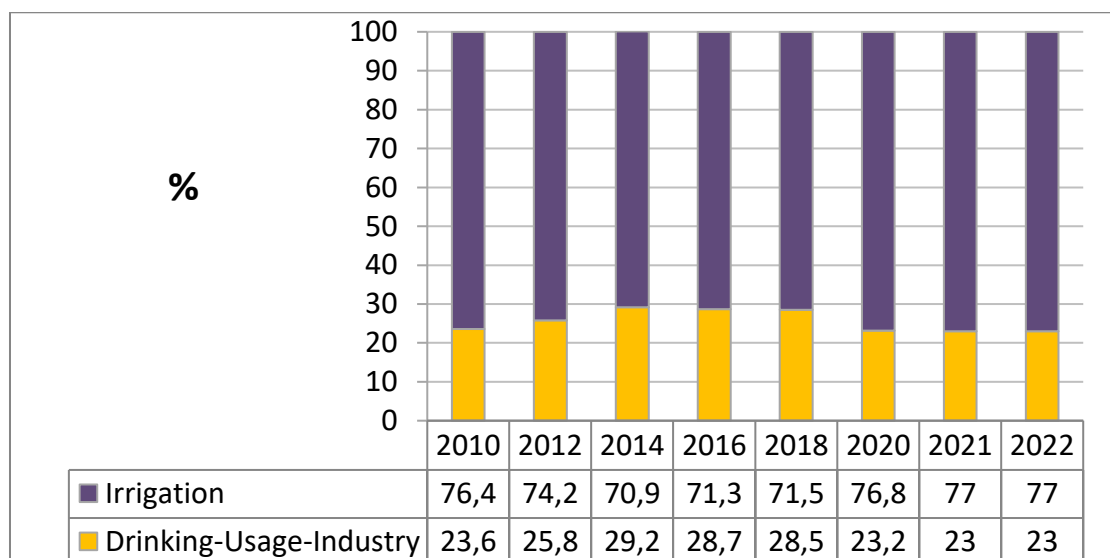
The water exploitation index (WEI) is is obtained by dividing the average annual total amount of water abstracted from freshwater by the average annual total renewable freshwater resources at the country level, expressed as a percentage.

The average annual precipitation in Turkiye is approximately 574 mm, which corresponds to an average of 450 billion m^3 of water per year. Within the framework of today's technical and economic conditions, the surface water potential that can be consumed for various purposes is 94 billion m^3 per year on average. Together with the groundwater potential determined as 18 billion m^3, the consumable surface and groundwater potential of our country is 112 billion m^3 per year on average, of which 57 billion m^3 is used. The annual amount of water available per capita in our country was 1 652 m^3 in 2000, 1 544 m^3 in 2009, 1 323 m^3 in 2021, and 1 322 m^3 in 2022[41].

6.2- Oxygen Consuming Substances in Rivers

The main indicator for oxygenation status in water bodies is the biochemical oxygen demand (BOD) parameter, which expresses the oxygen demand of aquatic organisms that consume oxidizable organic matter. In addition, ammonium is also a parameter that causes oxygen consumption in water bodies. The indicator "Oxygen Consuming Substances in River Waters" is a status indicator showing the current status and trends related to ammonium nitrogen (NH_4-N) and BOD in rivers.

The results of the monitoring studies carried out by the Ministry of Agriculture and Forestry in various basins were evaluated according to the criteria given in Annex-5 Table 2 of the "Law on Surface Water Quality" and the current situation in terms of BOD and NH_4-N parameters was revealed. In the basins where measurements were made, it was determined that the water quality in terms of BOD parameter was Class I (very good) in the Eastern Mediterranean, Kızılırmak and Antalya Basins, and Class I-II (very good/good) in the Eastern Black Sea and Konya Closed Basins. On the other hand, in Büyük Menderes Basin, which is under intense urban, agricultural and industrial pressure, it is seen that the water quality in terms of BOD parameter is worse and mostly reaches Class III (medium) levels. In addition, in terms of NH_4-N parameter, water quality is considered to be Class I in the Eastern Mediterranean, Kızılırmak, Antalya, Eastern Black Sea and Konya Closed Basins, and mostly Class I in the Büyük Menderes Basin, but in some stations it is at Class II-III levels.[42]

Graph 28- BUYUK MENDERES BASIN BIOCHEMICAL OXYGEN DEMAND (mg/L O_2)
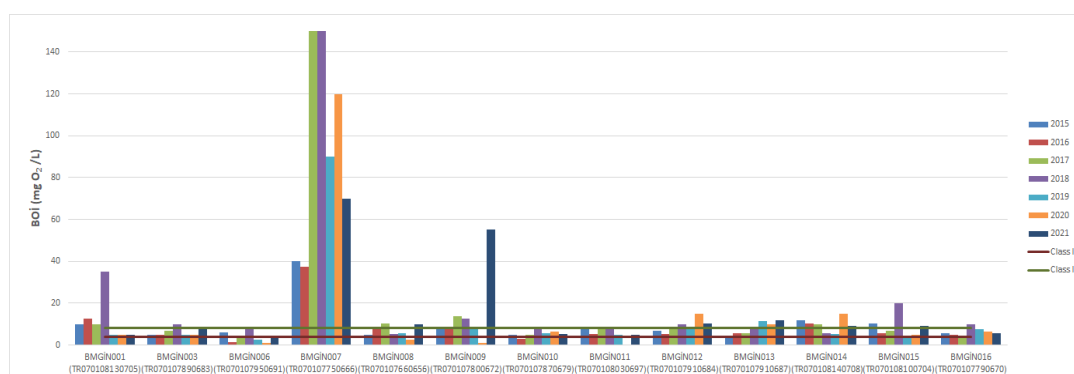
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 29- ANTALYA BASIN BIOCHEMICAL OXYGEN DEMAND (mg/L O₂)
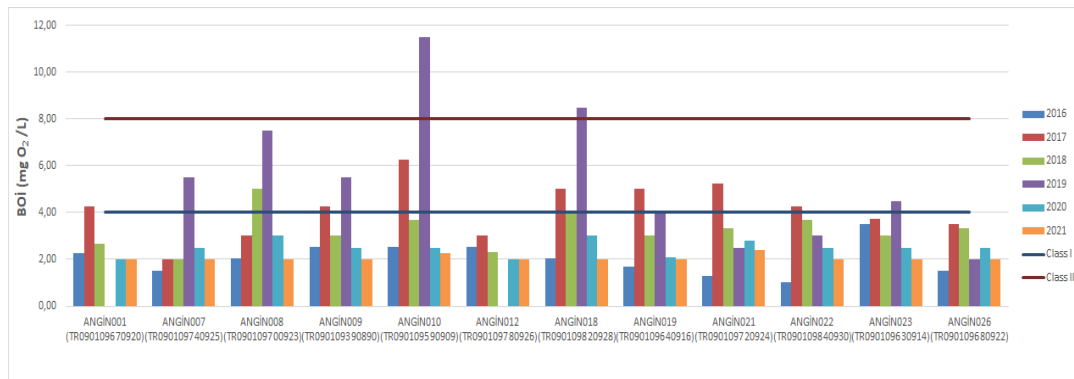
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 30-KONYA CLOSED BASIN BIOCHEMICAL OXYGEN DEMAND (mg/L O₂))
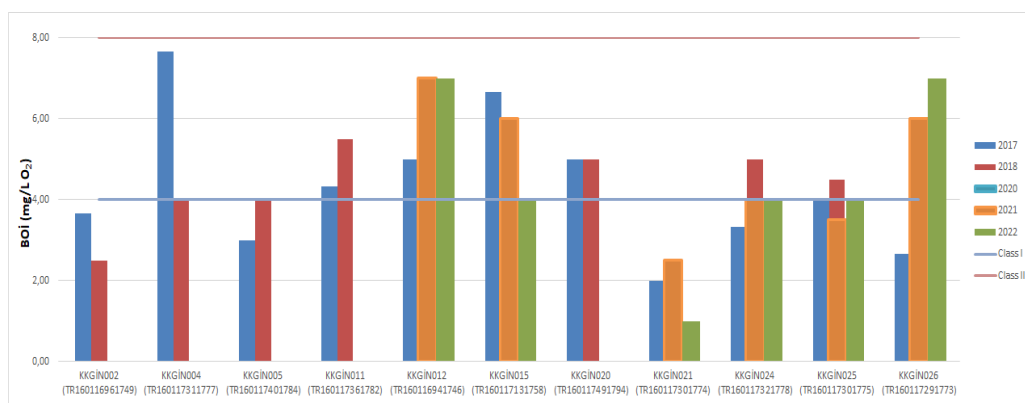
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 31- EASTERN MEDITERRANEAN BASIN BIOCHEMICAL OXYGEN DEMAND (mg/L O₂)
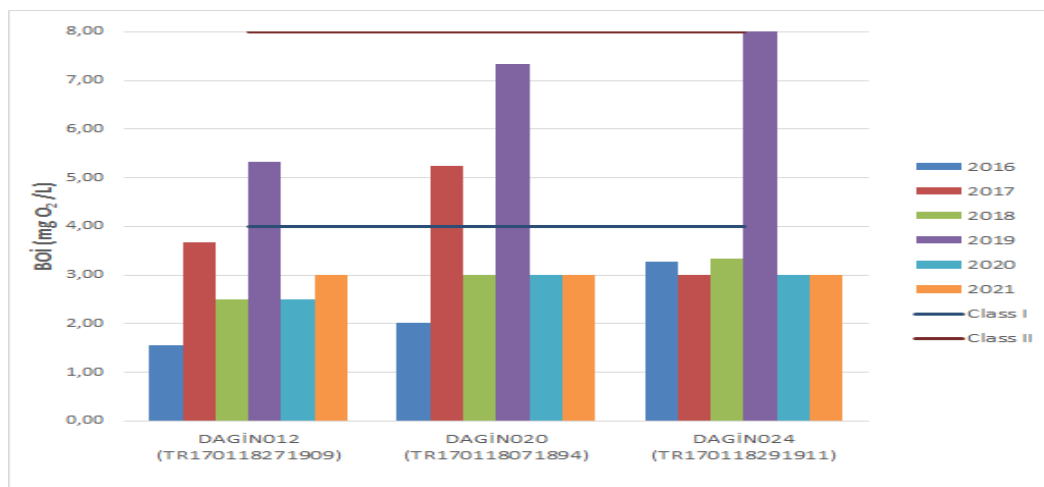
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 32-EASTERN BLACK SEA BASIN BIOCHEMICAL OXYGEN DEMAND (mg/L O₂)
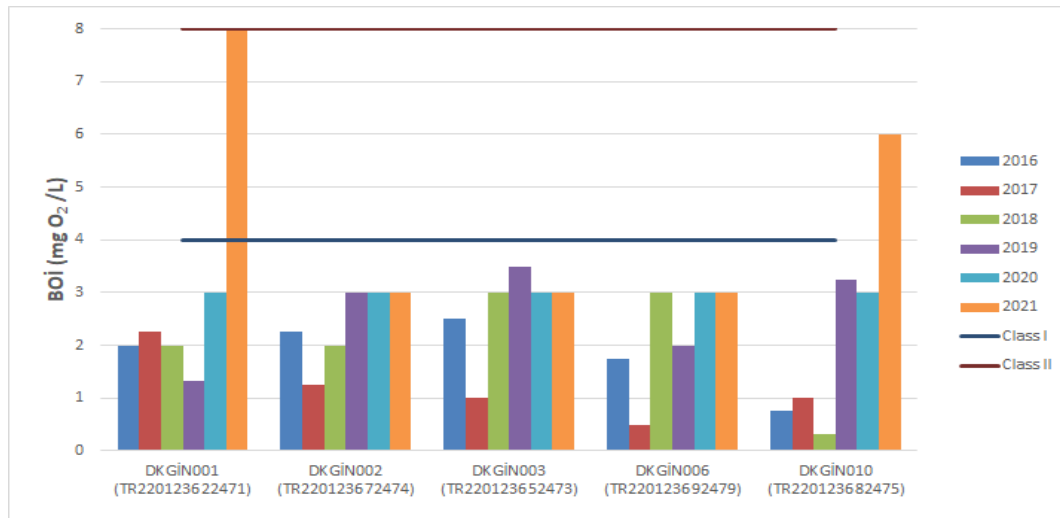
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 33-KIZILIRMAK BASIN BIOCHEMICAL OXYGEN DEMAND (mg/L O₂)
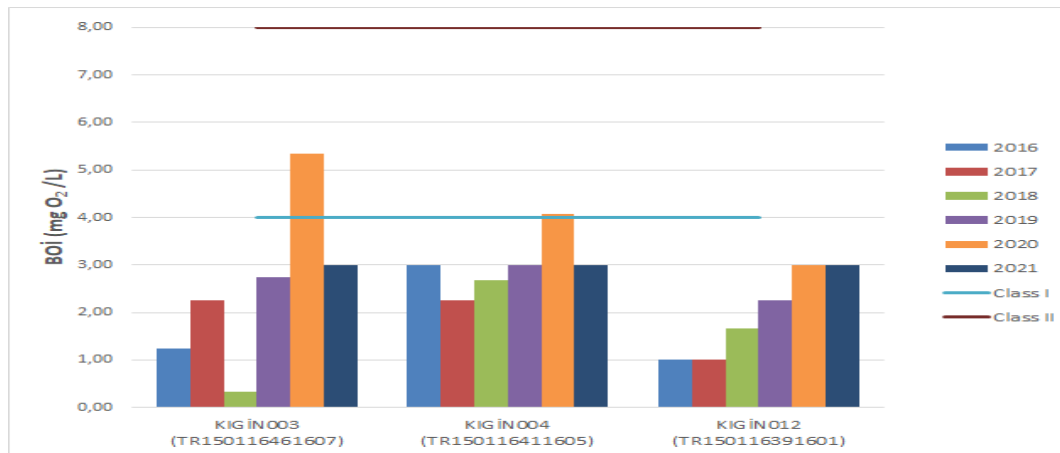
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 34-CHANGE IN BOD CONCENTRATION OVER THE YEARS
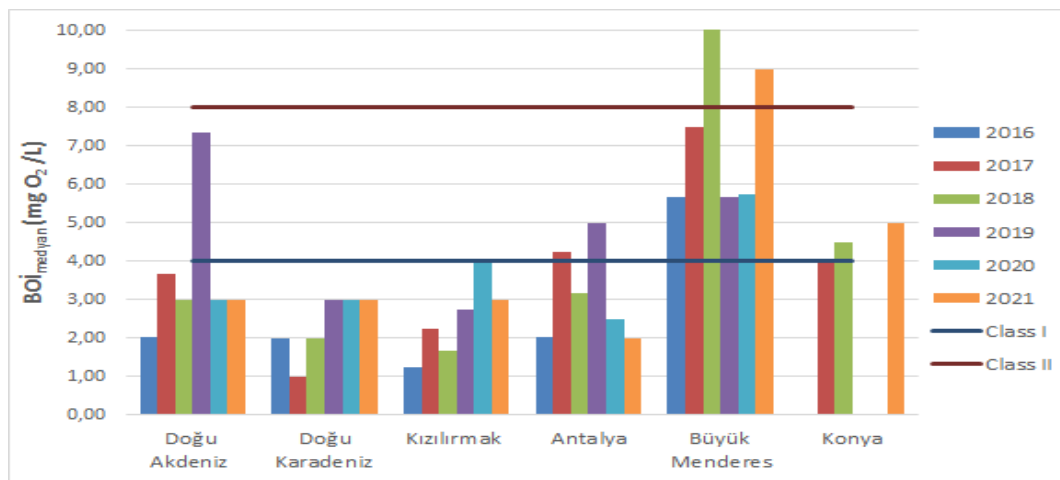
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

The change in water quality in the basins in terms of BOD parameter over the years was evaluated by considering the median concentrations. In 2021, although the basins generally maintain their water quality class, it can be said that water quality has improved in Kızılırmak and Antalya Basins. In Büyük Menderes Basin, there is a relative increase compared to previous years and it is at Class III (medium) water quality level.

Graph 35-BÜYÜK MENDERES BASIN NH$_4$ -N (mg/L)
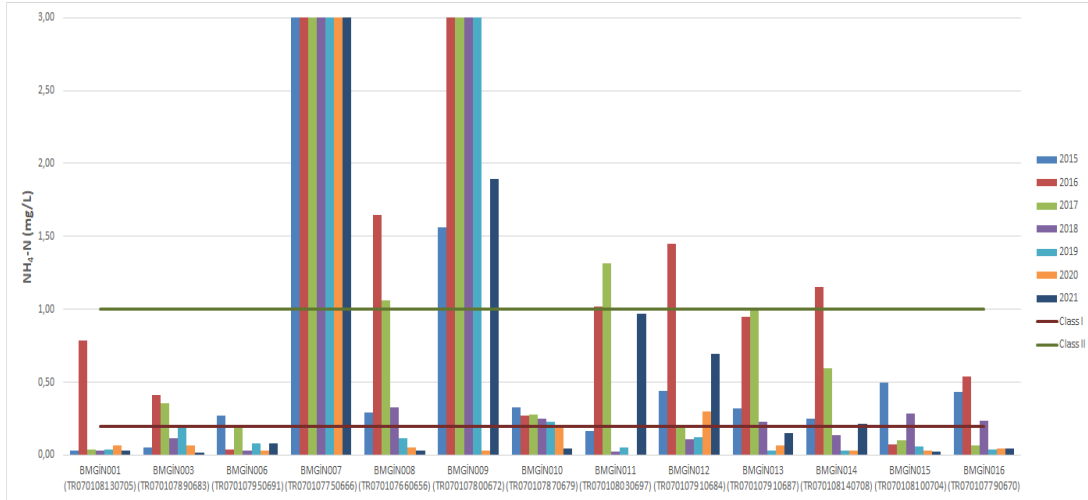
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 36-EASTERN BLACK SEA BASIN NH$_4$-N (mg/L)
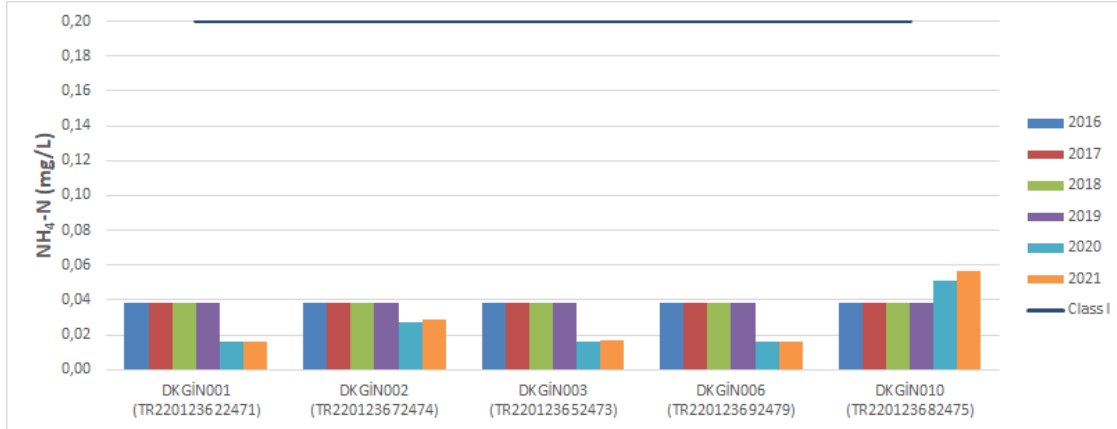
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 37-KIZILIRMAK BASIN NH₄-N (mg/L)
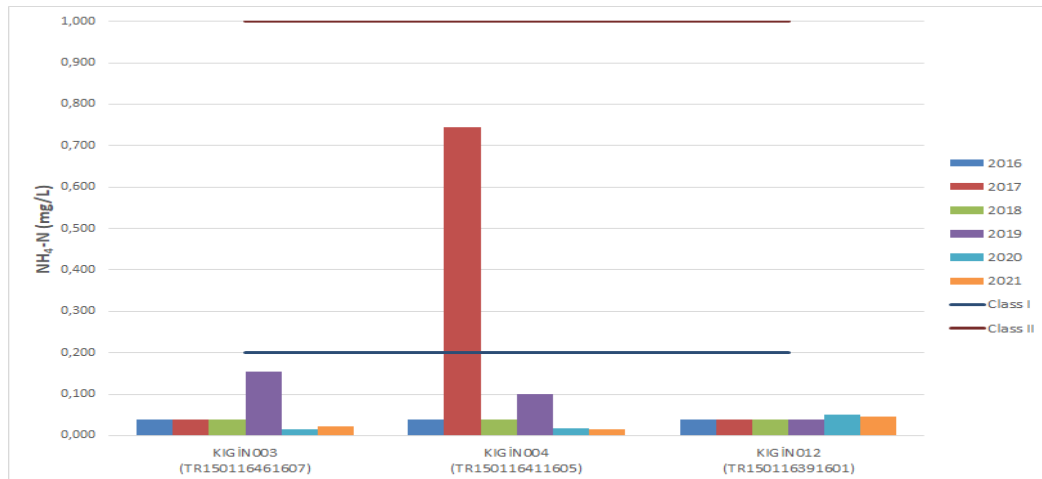
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 38-EASTERN MEDITERRANEAN BASIN NH₄-N (mg/L)
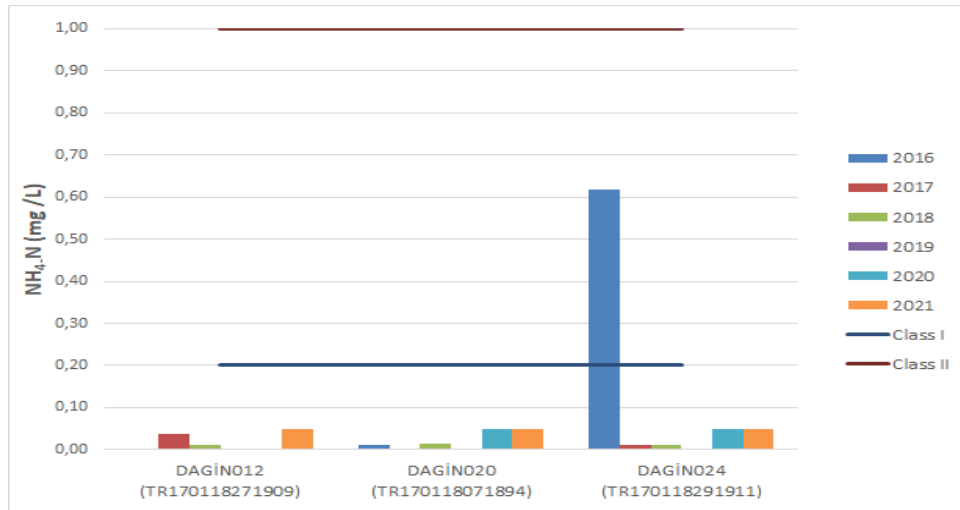
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 39-KONYA CLOSED BASIN NH₄-N (mg/L)
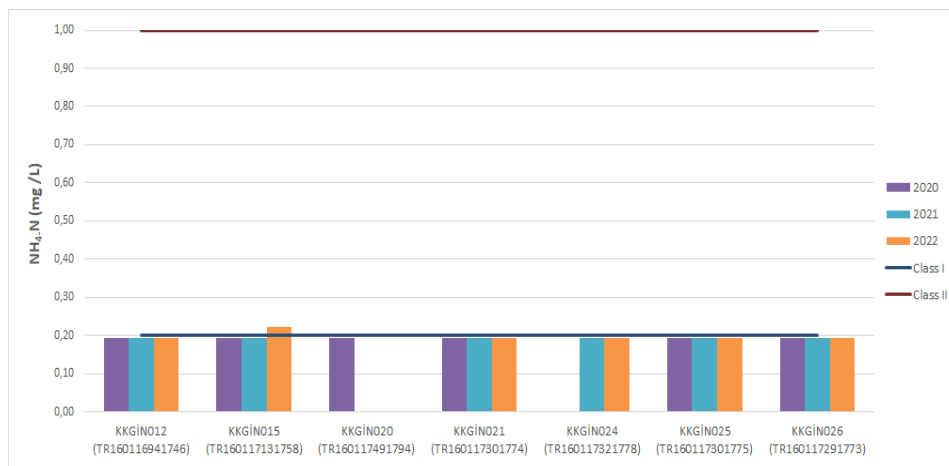
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 40-ANTALYA BASIN NH₄-N (mg/L)
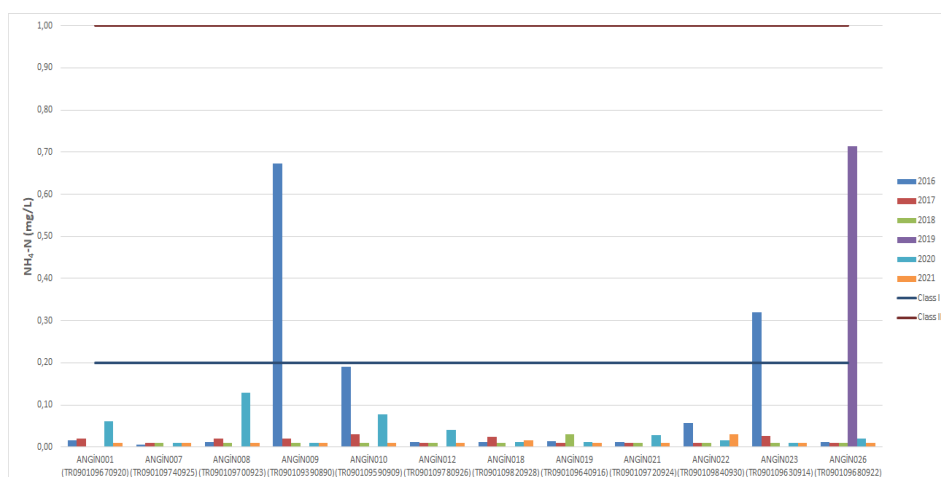
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 41- VARIATION OF NH₄-N CONCENTRATION IN BASINS BY YEARS (mg/L)
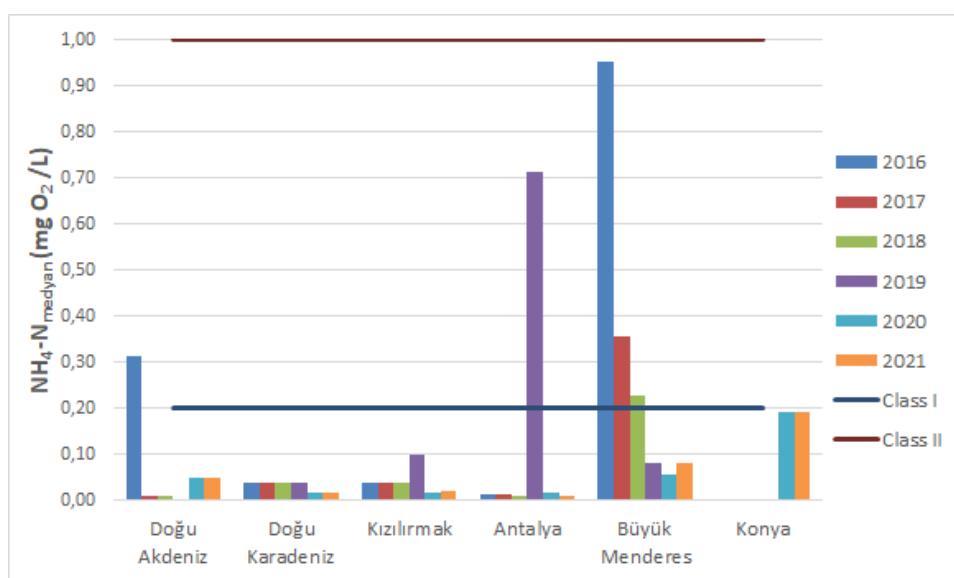
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

The change in water quality in the basins in terms of NH₄-N parameter over the years was evaluated by considering the median concentrations. Compared to other years, it can be said that there is an improvement in water quality in all basins in 2021 and it is at class I (very good) water quality level.

6.3. Nutrients in Fresh Water Resources

High inputs of nitrogen and phosphorus into water bodies from urban areas, industry and agriculture can cause eutrophication. The indicator is a status indicator used to show current nutrient levels and their temporal and spatial variations. Within the scope of this indicator, the changes of total nitrogen (TN), nitrate nitrogen (NO₃-N) and ortho phosphate phosphorus (O-PO₄ -P) parameters over time in water bodies were examined.

The results of the monitoring studies carried out by the Ministry of Agriculture and Forestry in various basins were evaluated according to the criteria given in Annex-5 Table 2 of the "Law on Surface Water Quality" and the current situation in terms of TN, NO₃-N and O-PO₄-P parameters was revealed. In the measured basins, it is seen that the water quality of the Eastern Mediterranean, Eastern Black Sea, Antalya and Konya Closed Basins is at Class I (very good) level in terms of NO₃-N parameter, while it varies between Class I-II (very good/good) levels in Kızılırmak and Büyük Menderes Basins.

On the other hand, in terms of TN parameter, the water quality of Eastern Mediterranean, Eastern Black Sea, Antalya and Konya Closed Basins are considered to be Class I, Kızılırmak Basin is considered to be Class I-II, Büyük Menderes Basin is mostly Class II, but in some stations it is considered to be Class I water quality. In terms of $O-PO_4$ parameter, it is seen that the water quality of the Eastern Black Sea and Kızılırmak Basin is Class I, the Eastern Mediterranean Basin is Class I-II, and the Antalya and Konya Closed Basins are Class II. Büyük Menderes Basin has mostly Class III (medium) water quality in terms of $O-PO_4$ parameter, but it can be said that it is at Class I water quality level in other stations.[43].

Graph 42-BÜYÜK MENDERES BASIN NO_3-N (mg/L)
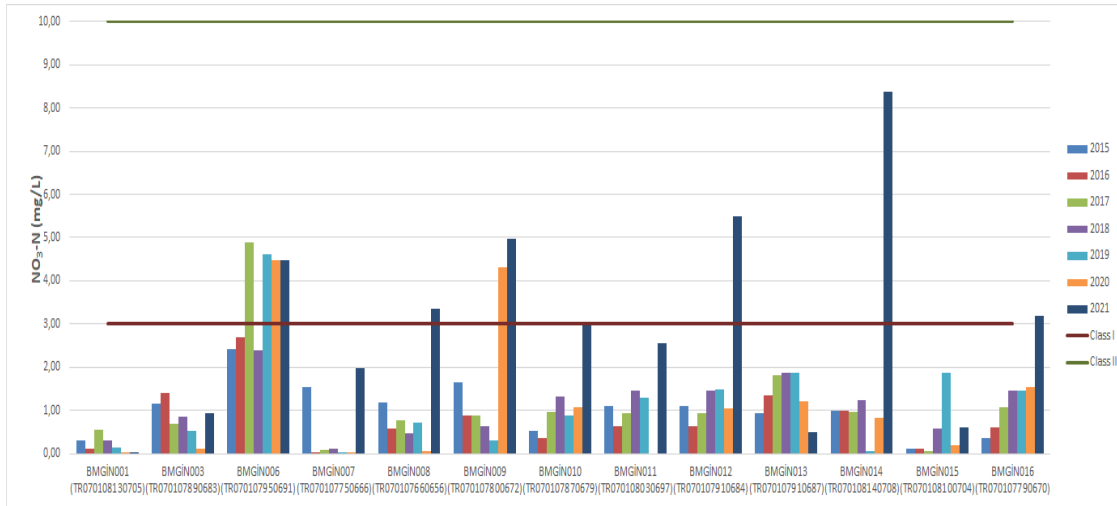
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 43- EAST BLACK SEA BASIN NO3-N (mg/L)
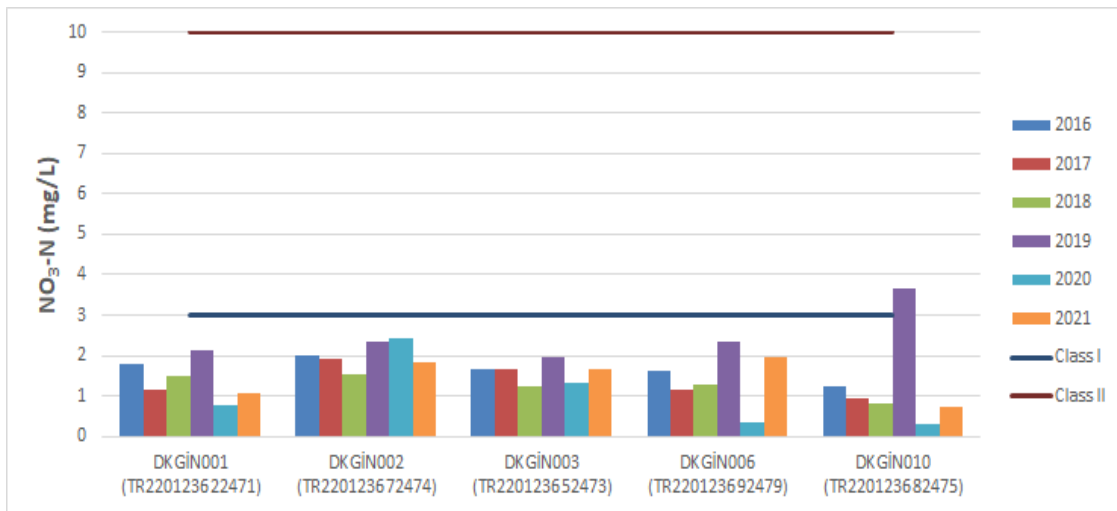
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 44-ANTALYA BASIN NO₃-N (mg/L)
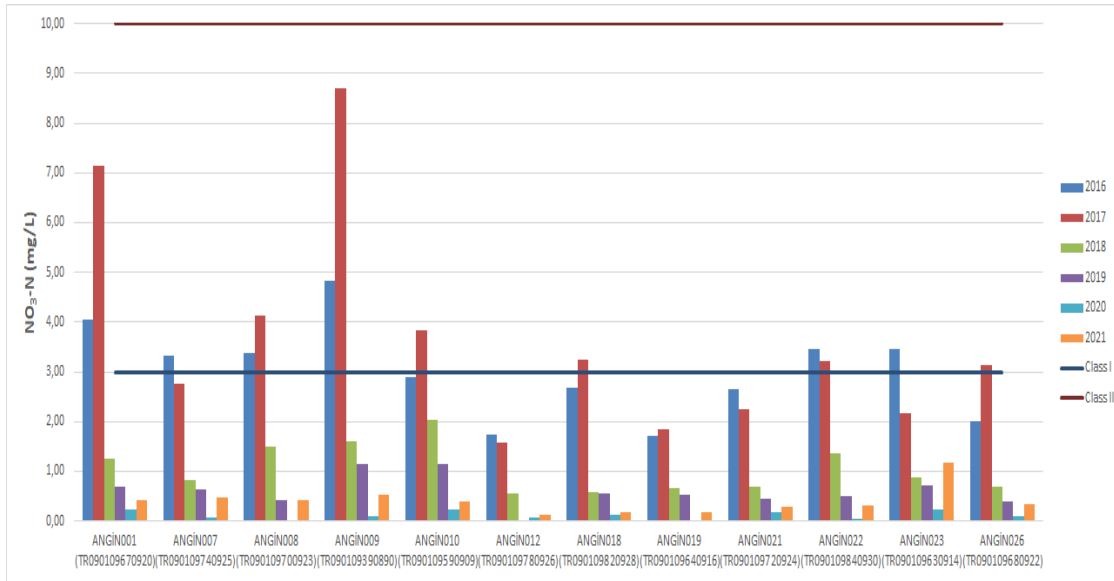
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 45-EASTERN MEDITERRANEAN BASIN NO₃-N (mg/L)
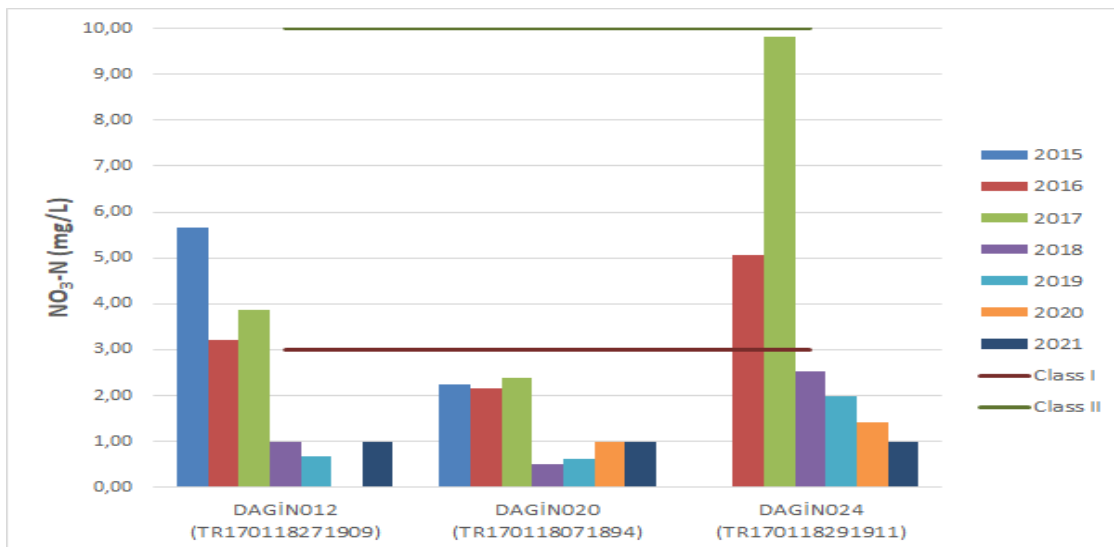
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 46-KIZILIRMAK BASIN NO₃-N (mg/L)
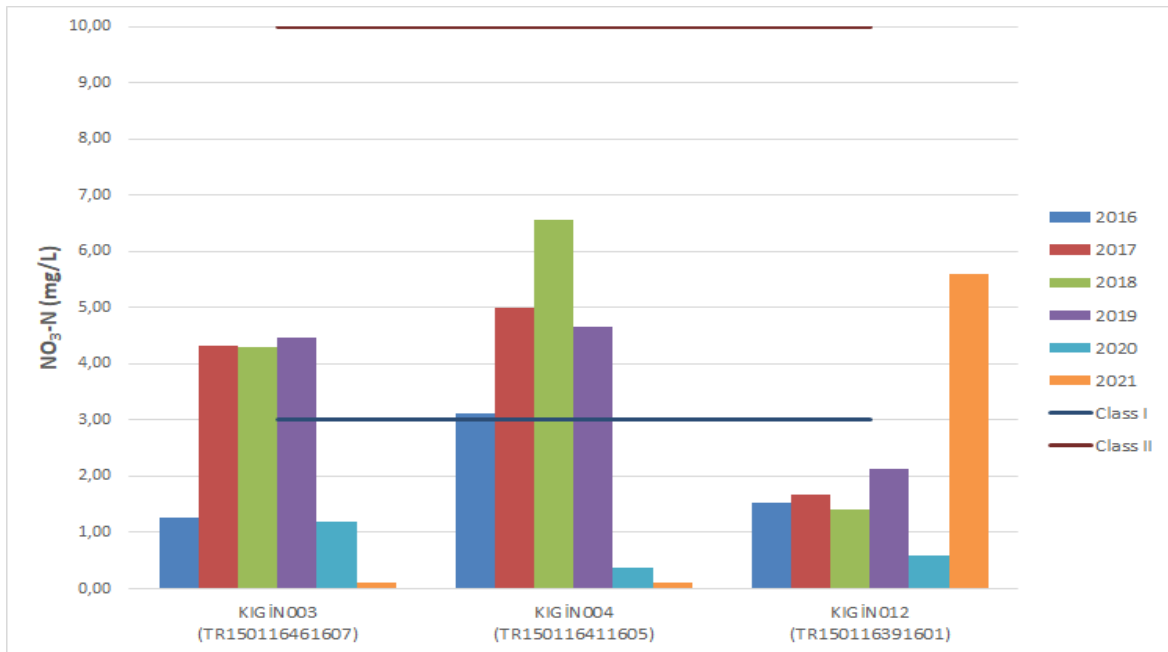
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 47-KONYA CLOSED BASIN NO₃-N (mg/L)
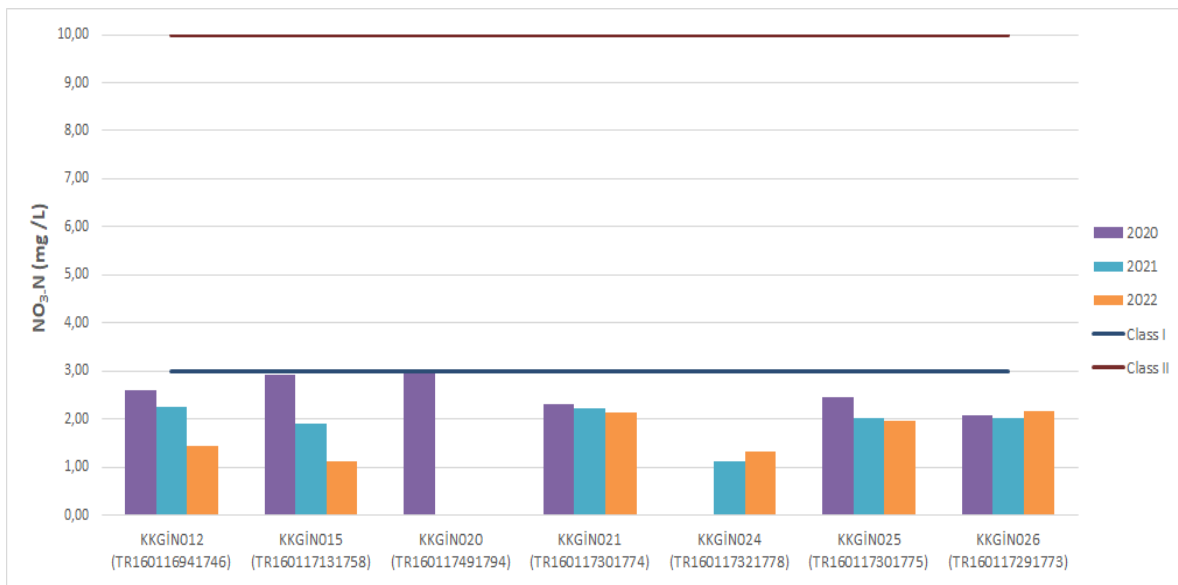
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 48- VARIATION OF NO$_3$-N CONCENTRATION IN BASINS BY YEARS
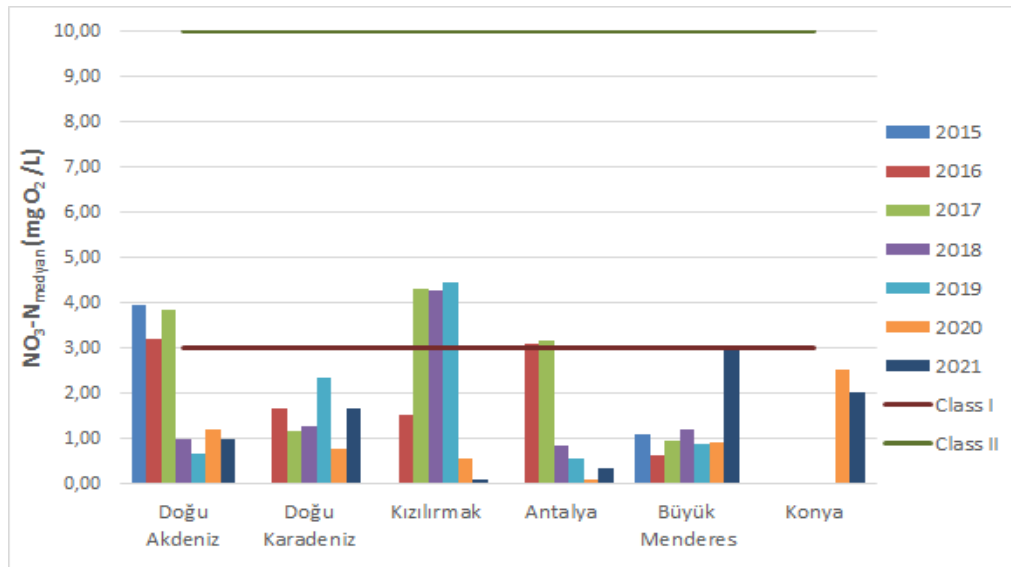
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

The change in water quality in the basins in terms of NO3-N parameter over the years was evaluated by considering the median concentrations. Compared to other years, it can be said that there is an improvement in water quality in the Eastern Mediterranean, Kızılırmak and Konya Closed Basins in 2021 and it is at the level of class I (very good) water quality. Although there is a relative increase in the Eastern Black Sea, Antalya and Büyük Menderes Basins in 2021, the water quality level of Class I is maintained in all basins when median concentrations are considered.

Graph 49-BÜYÜK MENDERES BASIN TN (mg/L)
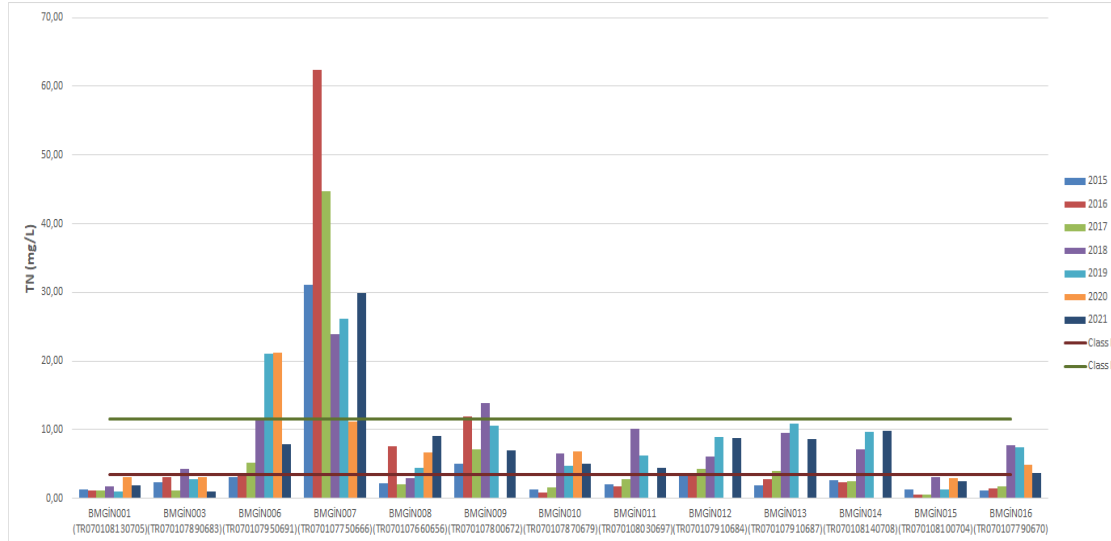
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 50-EASTERN BLACK SEA BASIN TN (mg/L)
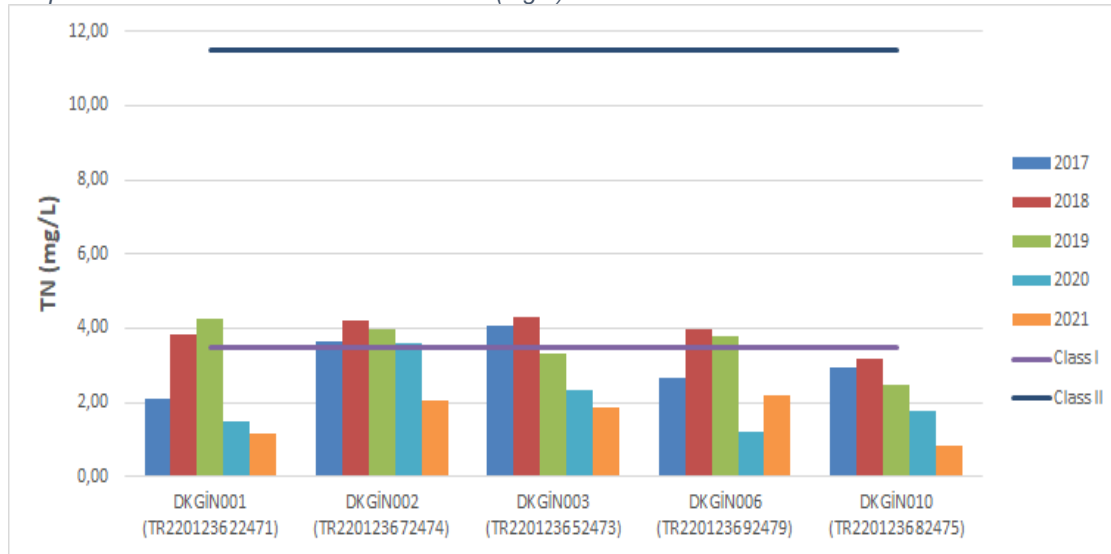
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 51-ANTALYA BASIN TN (mg/L)
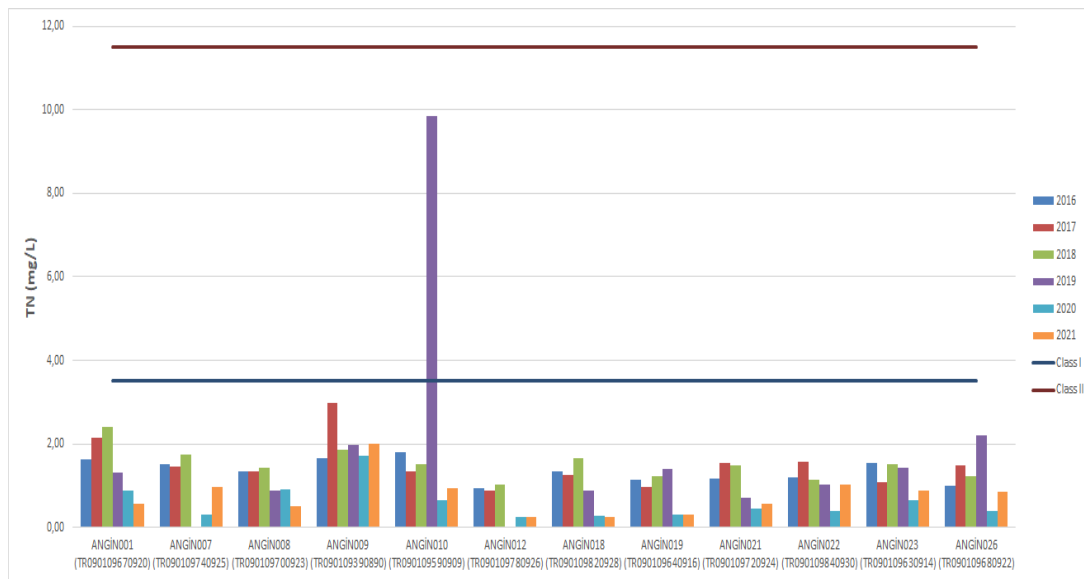
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 52-EASTERN MEDITERRANEAN BASIN TN (mg/L)
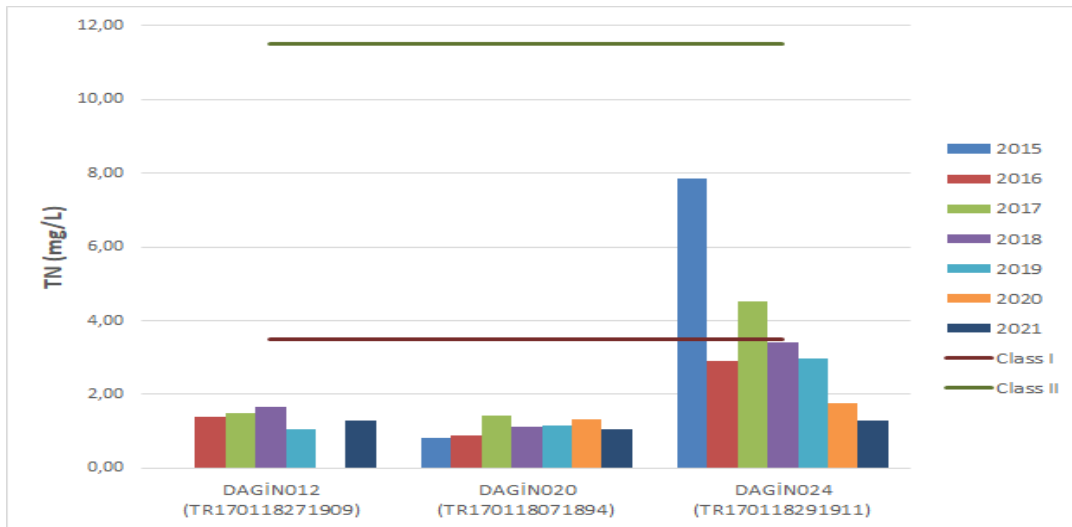
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 53-KIZILIRMAK BASIN TN (mg/L)
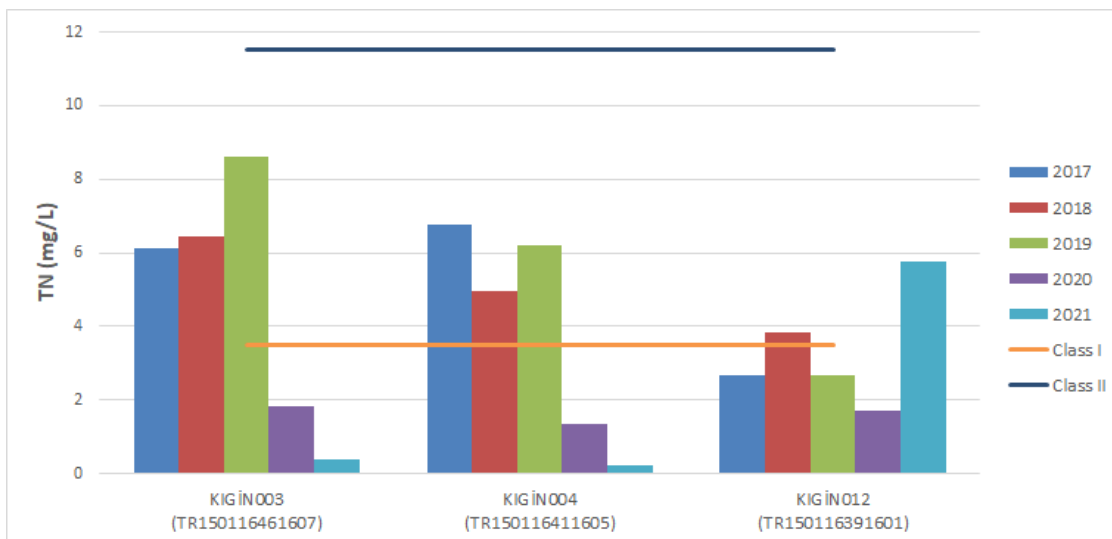
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 54-KONYA CLOSED BASIN TN (mg/L)
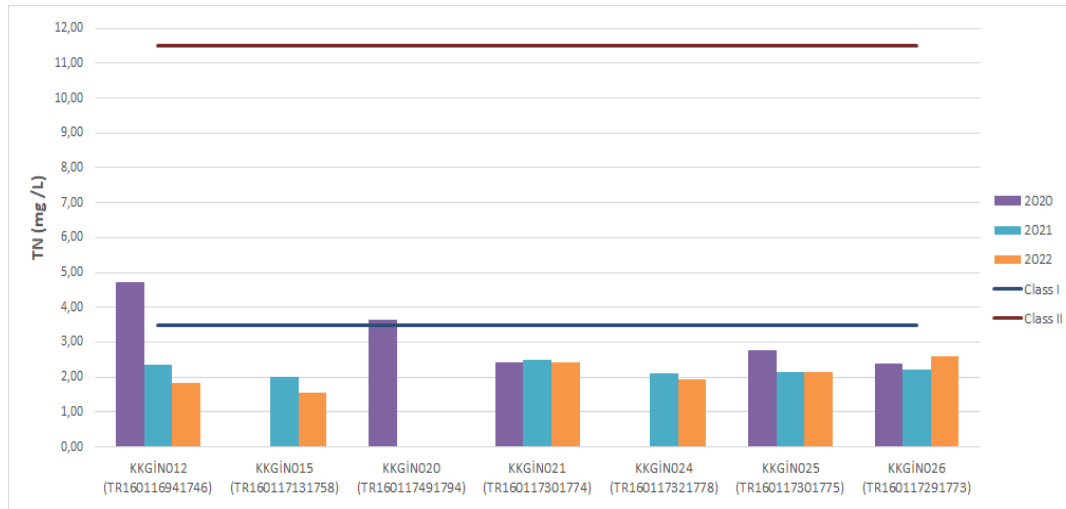
Graph 55- VARIATION OF TN CONCENTRATION IN BASINS BY YEARS
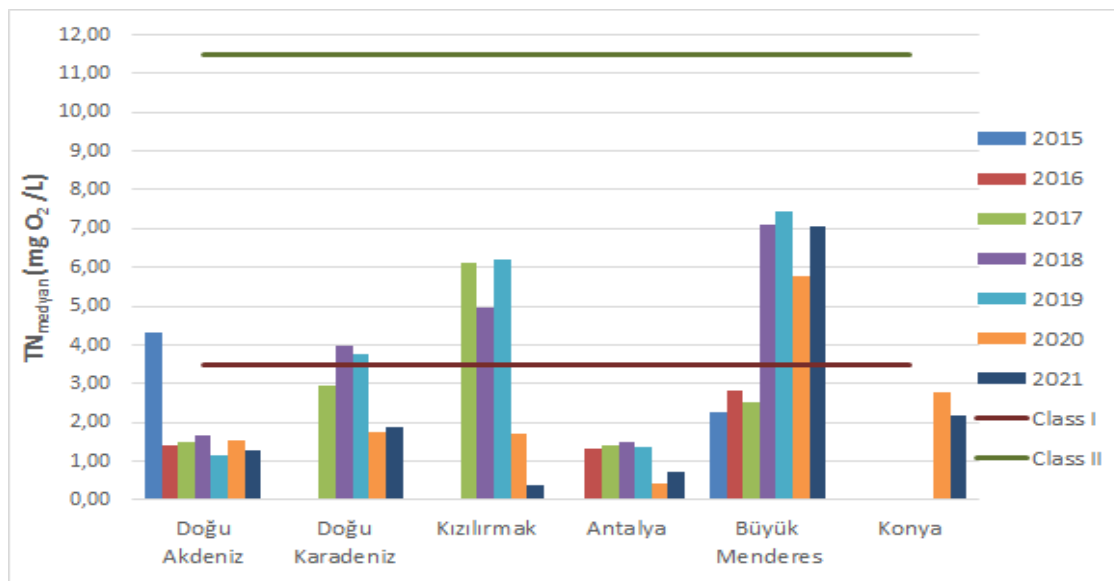
The change in water quality in the basins in terms of TN parameter over the years was evaluated by considering the median concentrations. Compared to other years, it can be said that there is an improvement in water quality in the Eastern Mediterranean, Kızılırmak and Konya Closed Basins in 2021 and they are at Class I (very good) water quality level. In the Eastern Black Sea and Antalya Basins, although there is a relative increase in 2021, it maintains the water quality level of Class I, and only in Büyük Menderes Basin, an increase is observed and Class II water quality level is observed.

Graph 56-BÜYÜK MENDERES BASIN o-PO₄-P (mg/L)
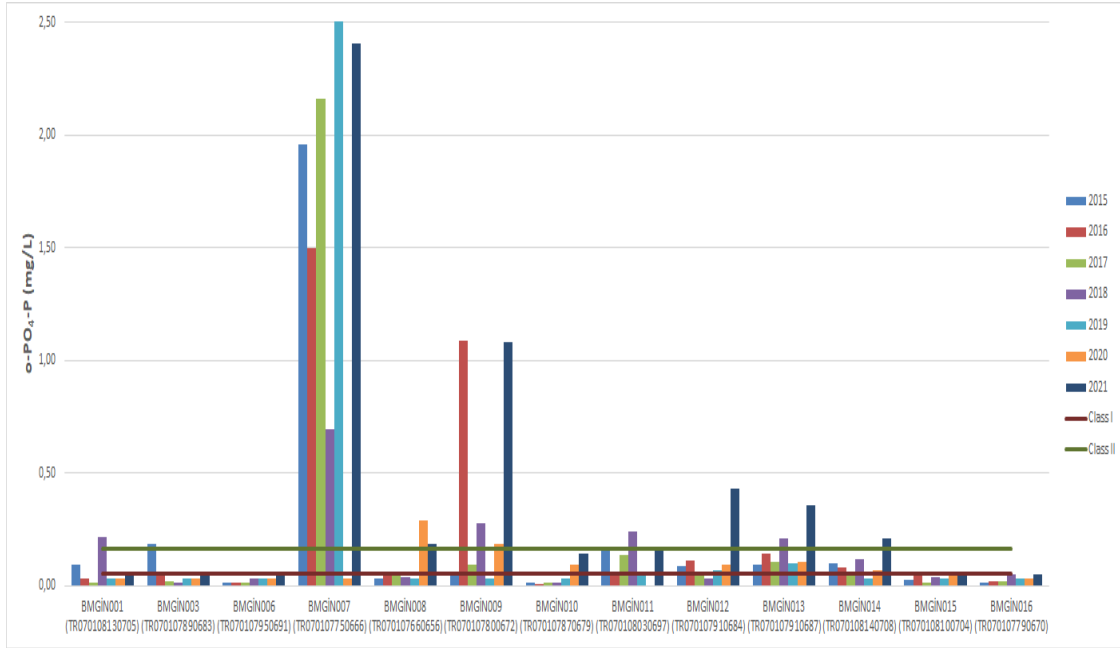
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 57-ANTALYA BASIN o-PO₄-P (mg/L)
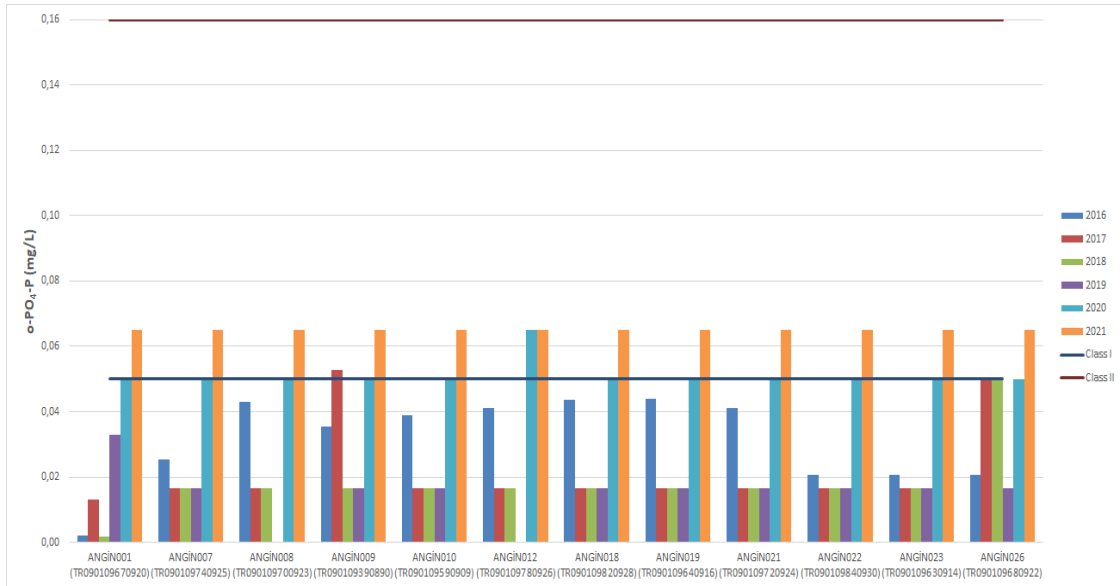
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 58-KONYA CLOSED BASIN o-PO₄-P (mg/L)
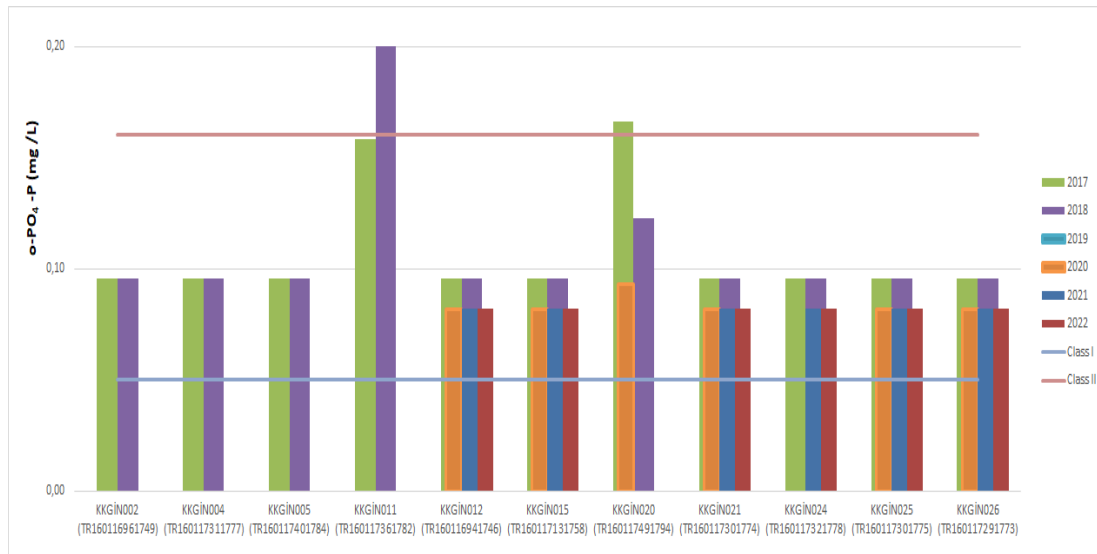
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 59-EASTERN MEDITERRANEAN BASIN o-PO₄-P (mg/L)
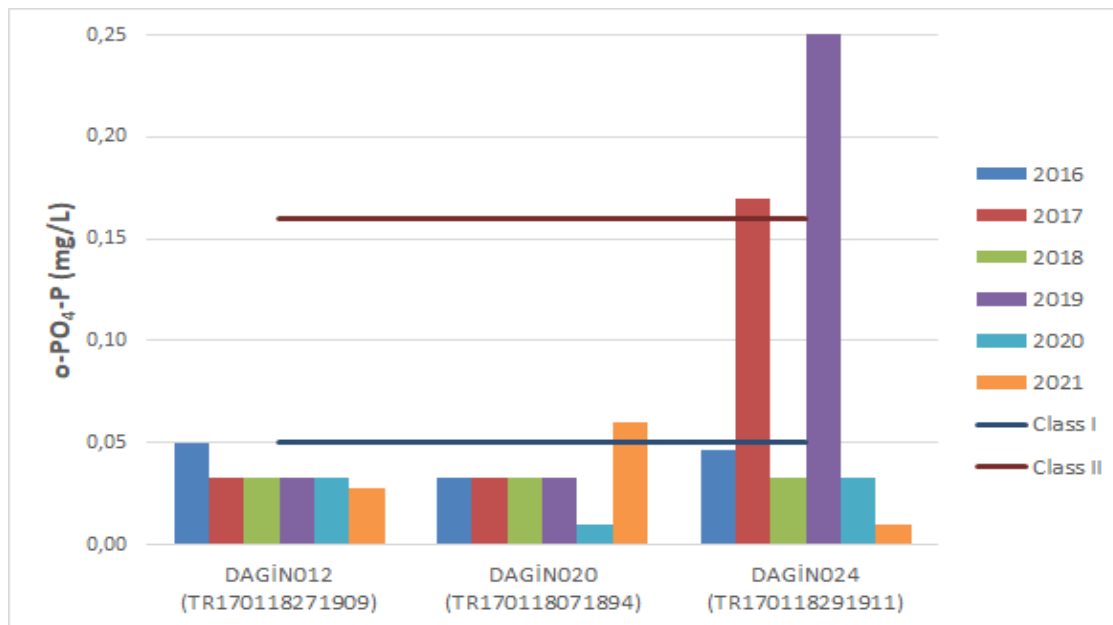
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 60-EASTERN BLACK SEA BASIN o-PO₄-P (mg/L)
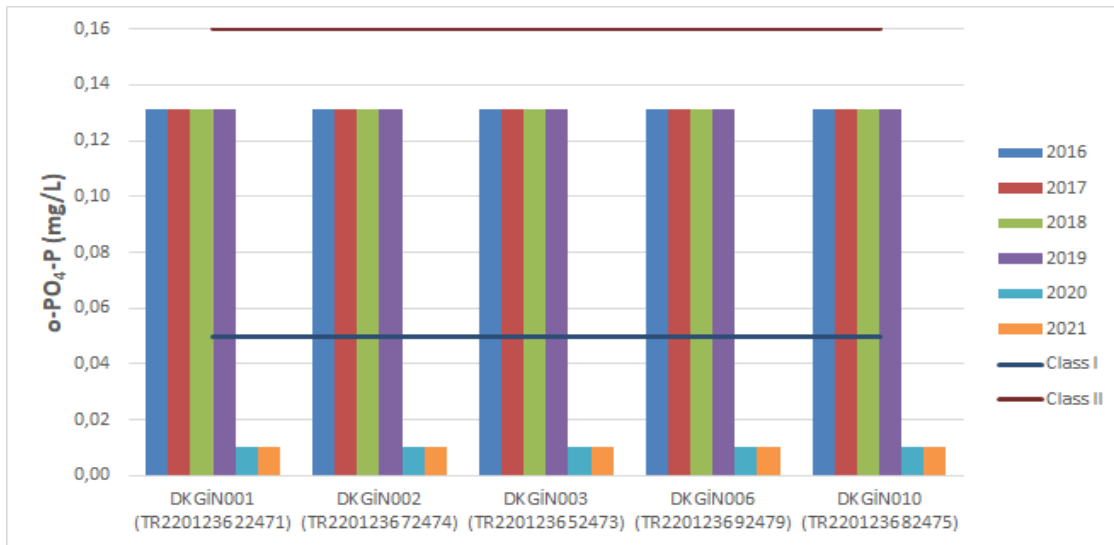
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 61-KIZILIRMAK BASIN o-PO₄-P (mg/L)
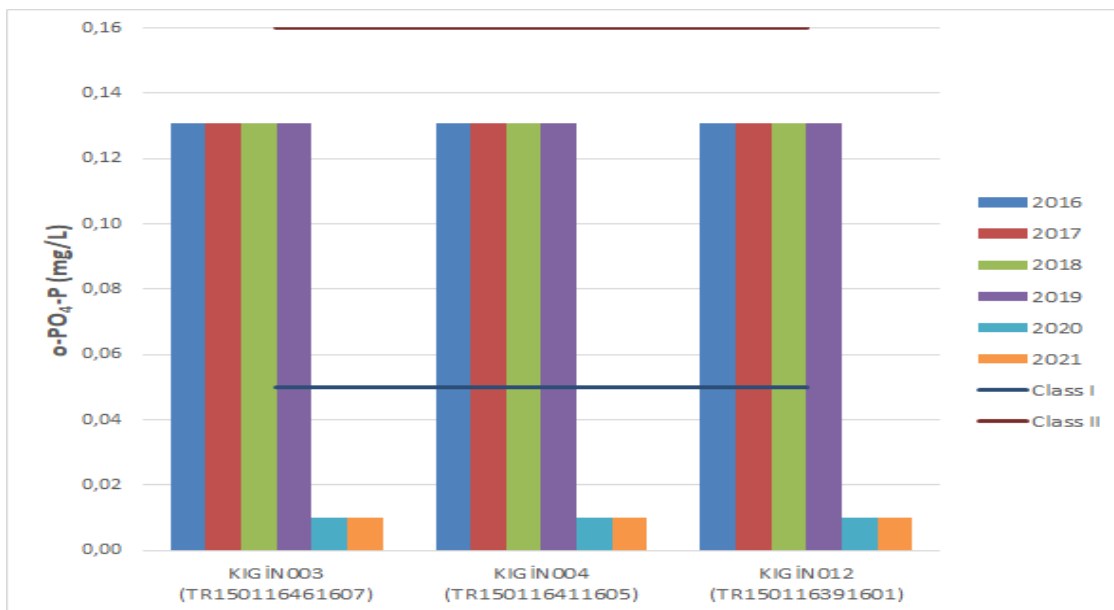
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

Graph 62- VARIATION OF o-PO₄-P CONCENTRATION IN BASINS BY YEARS
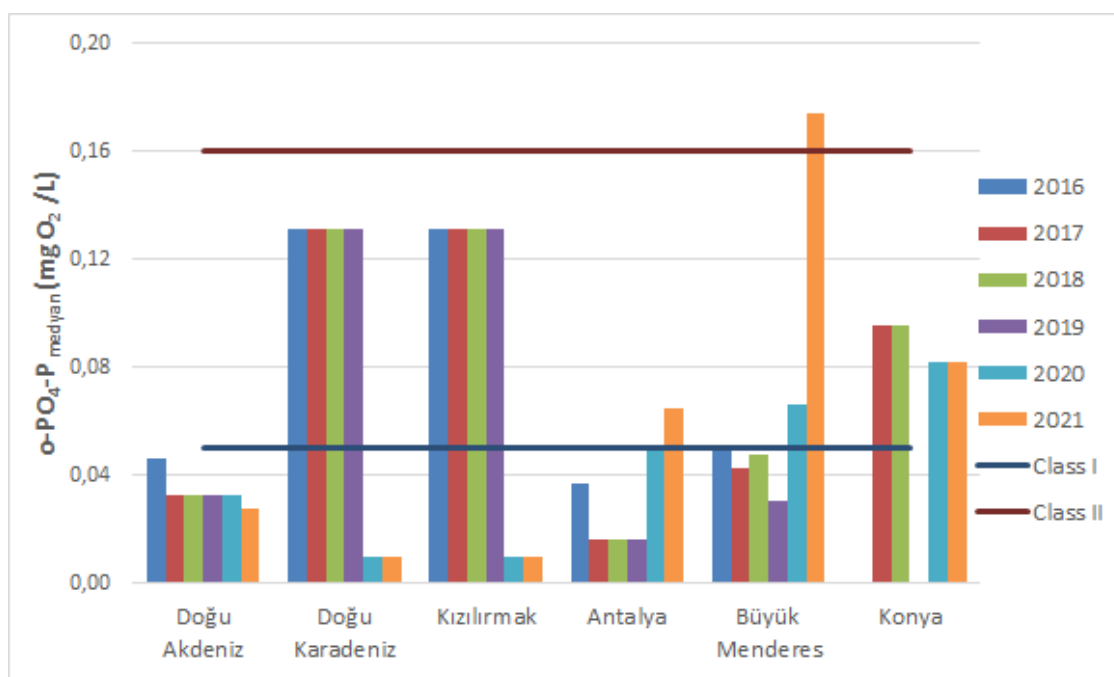
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management; 2023

The change in water quality in terms of o-PO4-P parameter in the basins over the years was evaluated by considering the median concentrations. Compared to other years, in 2021, the water quality in Antalya and Büyük Menderes Basins has regressed by 1 (one) level and is evaluated as Class II (good) in Antalya Basin and Class III (moderate) in Büyük Menderes Basin. While the Eastern Mediterranean, Eastern Black Sea and Kızılırmak Basins have Class I (very good) water quality in terms of o-PO4-P parameter, it can be said that the water quality in Konya Closed Basin is maintained at Class II level.

When a general evaluation is made for all basins; it is seen that Büyük Menderes Basin is the most polluted basin in terms of all parameters. The reason for this can be attributed to the intensive industrial and agricultural activities carried out in the basin and the high urban pressures. For the other basins, the water quality is generally at Class I-II level, but it maintains its current quality compared to the past years and meets the water quality targets [44].

6.4- Chlorophyll-a Concentration in Coastal and Marine Waters

Chlorophyll-a, an indicator of phytoplankton biomass, performs photosynthesis and through this mechanism primary organic matter is produced in the nutrient cycle. The organic load and organic wastes produced in the light layer and in associated productions settle deeper in the water column, causing bacterial decomposition and the utilization of dissolved oxygen in the water and a decrease in the oxygen needed for life.

"Integrated Marine Pollution Monitoring Program" is carried out by the Department of Laboratory, Measurement and Monitoring of the Ministry of Environment, Urbanization and Climate Change under the coordination of TÜBİTAK-MAM. In this context, the quality and pollution status of our seas are revealed with various indicators through monitoring studies in the Mediterranean Sea, Aegean Sea, Marmara Sea and Black Sea.
Marine pollution and quality assessments are made on the basis of water management units (WMUs). Water Management Units, or in other words Coastal Water Bodies, define a section of surface water that is separated from surface waters with important characteristics - physically, hydromorphologically, ecologically and by analyzing pressures. They are the smallest management units covered by the Water Framework Directive.

Phytoplankton biomass increased in the Mediterranean Sea during the winter period in the areas of CWBs (especially in the CWBs covering Mersin and Iskenderun bays) fed by nutrient salts carried by high-flow rivers and urban wastewaters. During dry summer periods, relatively low Chl-a values were measured as a result of reduced terrestrial pressures. As we move from Iskenderun to Marmaris outer Gulf area, Chl-a values are lower in Antalya Gulf, Finike Region and the CWBs located in Marmaris outer Gulf area, where the terrestrial impact

(rivers + domestic wastewater input) is relatively reduced and the coastal-offshore interaction is strong, compared to the CWBs located in Iskenderun and Mersin gulfs. Only the inner Gulf of Fethiye breaks this pattern, where Chl-a concentrations in both summer and winter periods are higher in phytoplankton biomass than in offshore water bodies (Graph 63).

In the Aegean Sea, in general, the North Aegean has higher chlorophyll-a values than the Central and South Aegean sections, and the Gulf of Izmir stands out from all Aegean Sea chlorophyll-a concentrations. In 2022, the highest chlorophyll-a concentration was found in Izmir Bay. At station IZMSW2 (Izmir Inner Gulf), the chlorophyll-a concentration reached 6.82 µg/L in winter and 15.29 µg/L in summer. Relatively high concentrations (> 0.5 µg/L) were measured in the Meriç River, Güllük Bay, Akbük Bay, Bakırçay and Büyük Menderes Mouth (Graph 64).

In the Black Sea in 2022, it varies between 0.32- 7.59 µg/L in winter and 0.16- 7.24 µg/L in summer. Relatively high values were observed in the winter period at stations on the coasts of Istanbul and Samsun, Yeşilırmak River, Fatsa and Filyos River, while high values were observed in the summer period at stations on the Sakarya River, Black Sea Ereğlisi coast and Samsun discharge control stations (Graph 65).

When the chlorophyll-a values of the surface layer (0-10 m average) in the Marmara Sea in 2022 are examined, it is seen that they vary between 0.19-12.26 µg/L, with the highest value measured in Izmit Inner Gulf in the spring period (Graph 66).

Graph 63- COMPARISON OF CHLOROPHYLL-A CONCENTRATIONS IN SURFACE WATER OF THE MEDITERRANEAN SEA 2014-2022
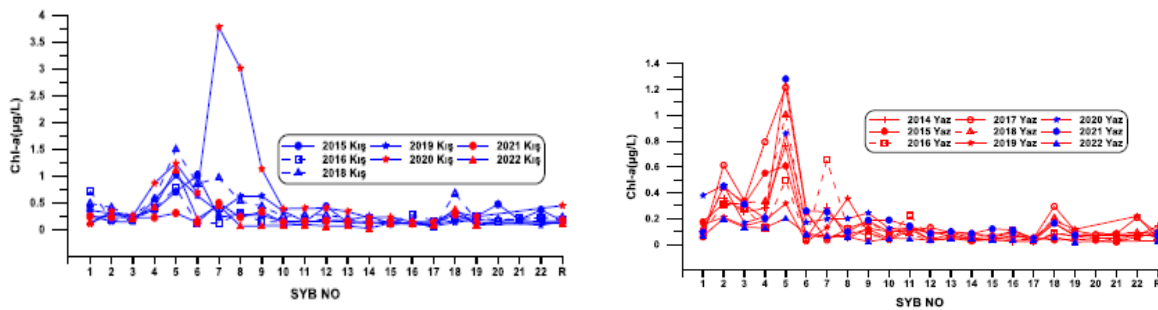
Source: ÇŞİDB-ÇEDİDGM and TÜBİTAK-MAM (2022). Integrated Marine Pollution Monitoring Program (2020-2022). (Mediterranean Final Report, 2022), 2022, Gebze-Kocaeli.

Graph 64- COMPARISON OF CHLOROPHYLL-A CONCENTRATIONS IN SURFACE WATER OF THE EAGEAN SEA 2014-2022
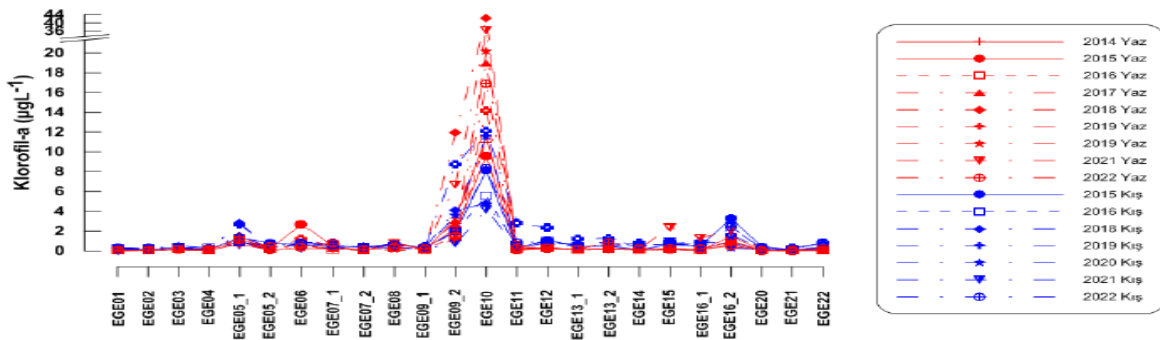
Source: ÇŞİDB-ÇEDİDGM and TÜBİTAK-MAM (2020). Integrated Marine Pollution Monitoring Program (2020-2022). (Aegean Sea Final Report, 2022), 2022, Gebze-Kocaeli.

Graph 65- COMPARISON OF CHLOROPHYLL-A CONCENTRATIONS IN SURFACE WATER OF THE BLACK SEA 2014-2022
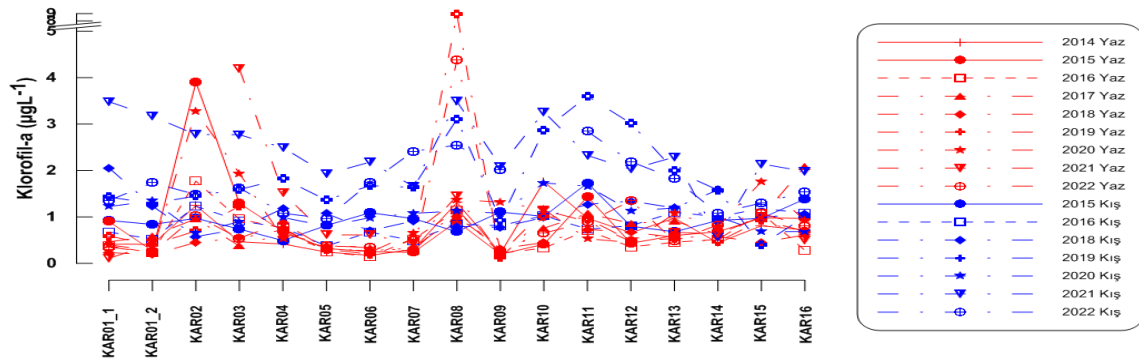
Source: ÇŞİDB-ÇEDİDGM and TÜBİTAK-MAM (2020). Integrated Marine Pollution Monitoring Program (2020-2022). (Black Sea Final Report, 2022), 2022, Gebze-Kocaeli

Graph 66- COMPARISON OF CHLOROPHYLL-A CONCENTRATIONS IN SURFACE WATER OF THE MARMARA SEA 2014-2022
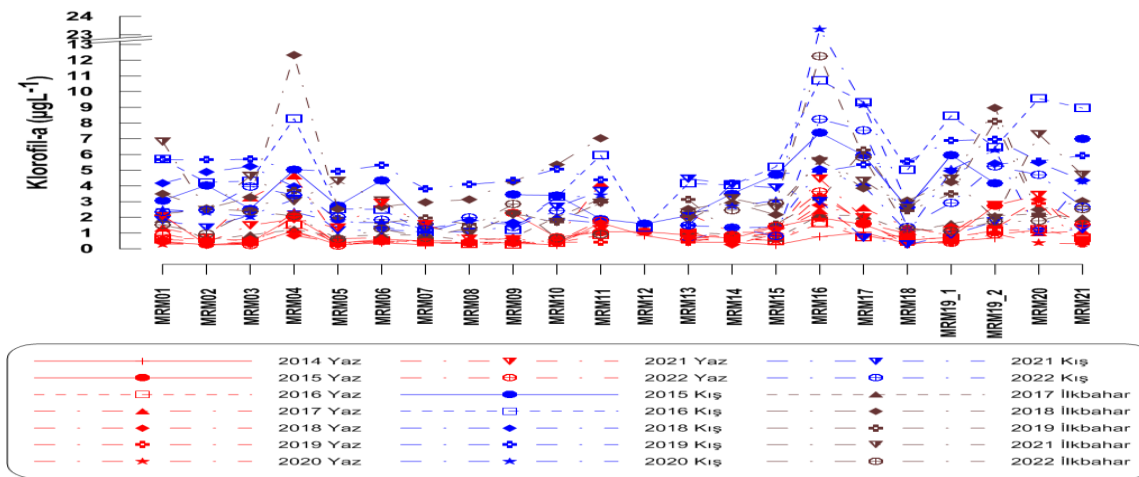
Source: ÇŞİDB-ÇEDİDGM and TÜBİTAK-MAM (2020). Integrated Marine Pollution Monitoring Program (2020-2022). (Marmara Sea Final Report, 2022), 2022, Gebze-Kocaeli.

6.5- Nutrients in Coastal and Marine Waters

The nutrient indicator is a status indicator used to show geographical variations in current nutrient concentrations and temporal trends. Large inputs of nitrogen and phosphorus transported/discharged to the sea from urban areas, industry and agriculture can cause eutrophication.

"Integrated Marine Pollution Monitoring Program" is carried out by the Department of Laboratory, Measurement and Monitoring of the Ministry of Environment, Urbanization and Climate Change under the coordination of TÜBİTAK-MAM. In this context, the quality and pollution status of our seas are revealed with various indicators through monitoring studies in the Mediterranean Sea, Aegean Sea, Marmara Sea and Black Sea.
Marine pollution and quality assessments are made on the basis of water management units (WMUs). Water Management Units, or in other words Coastal Water Bodies, define a section of surface water that is separated from surface waters with important characteristics - physically, hydromorphologically, ecologically and by analyzing pressures. They are the smallest management units covered by the Water Framework Directive.

Surface dissolved inorganic nitrogen (DIN), silicate (Si), nitrite-nitrate nitrogen (Nox) and total phosphorus (TP) concentrations were evaluated in nutrient element surface distributions[45].
Mediterranean coastal waters, PO4 and TP values are relatively high in Iskenderun, Mersin and Fethiye Bays where terrestrial pressures are evident. The highest values were measured in the surface waters of the EMU fed by river inputs (Asi, Ceyhan,

Seyhan, Göksu river waters) in winter. TP values in winter 2022 were relatively higher in almost all coasts compared to other years, especially Fethiye Inner Gulf had the highest TP value. In the late summer (August) period, surface water phosphate and TP averages of the CWBs decreased with the seasonal decrease in riverbanks and similar average values were obtained in marine areas where terrestrial pressure was weak. Depending on the river input, the areal distribution of total dissolved inorganic nitrogen (DIN) and the mean values of SICs showed a decreasing trend from Iskenderun Bay to Marmaris Bay (east-west direction) in the Mediterranean Region. DIN concentration values in the coastal and offshore waters of the Gulf of Antalya and Finike Region are close to the general characteristics of the eastern Mediterranean in summer and winter periods. NOx concentrations in coastal marine areas, which are seasonally affected by inputs due to rivers with increased flow rates in winter and precipitation, increased significantly in winter (Graph 67).

Graph 67- MEDITERRANEAN SURFACE WATER NUTRIENTS 2014-2022 COMPARISON
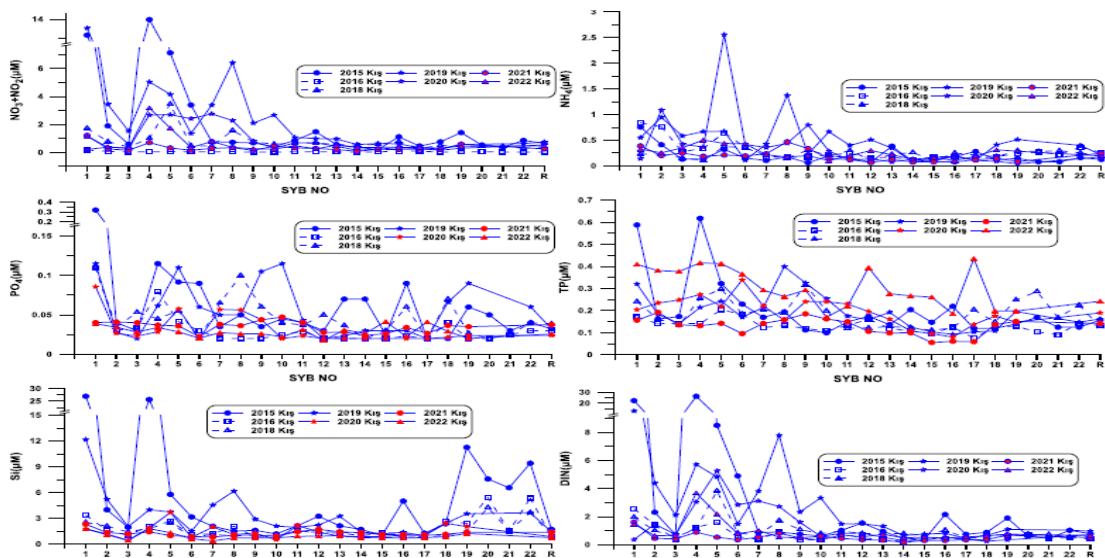
Source: ÇŞDİB-ÇEDİDGM and TÜBİTAK-MAM (2022). Integrated Marine Pollution Monitoring Program (2020-2022) (Mediterranean Final Report, 2022), 2022, Gebze-Kocaeli.

In the Aegean Sea, NOx values are above 0.1 µM in most of the EMBs during the winter period, but in Izmir Inner Gulf (EGE10), NOx value is 3.26 µM and NH4-N concentration is 22.51 µM. This is thought to be due to high pressures such as urban, industrial and maritime traffic in the Inner Gulf of Izmir and pollution inputs from low-flow streams (Graph 68).

Graph 68- EAGEAN SEA SURFACE WATER NUTRIENTS 2014-2022 COMPARISON
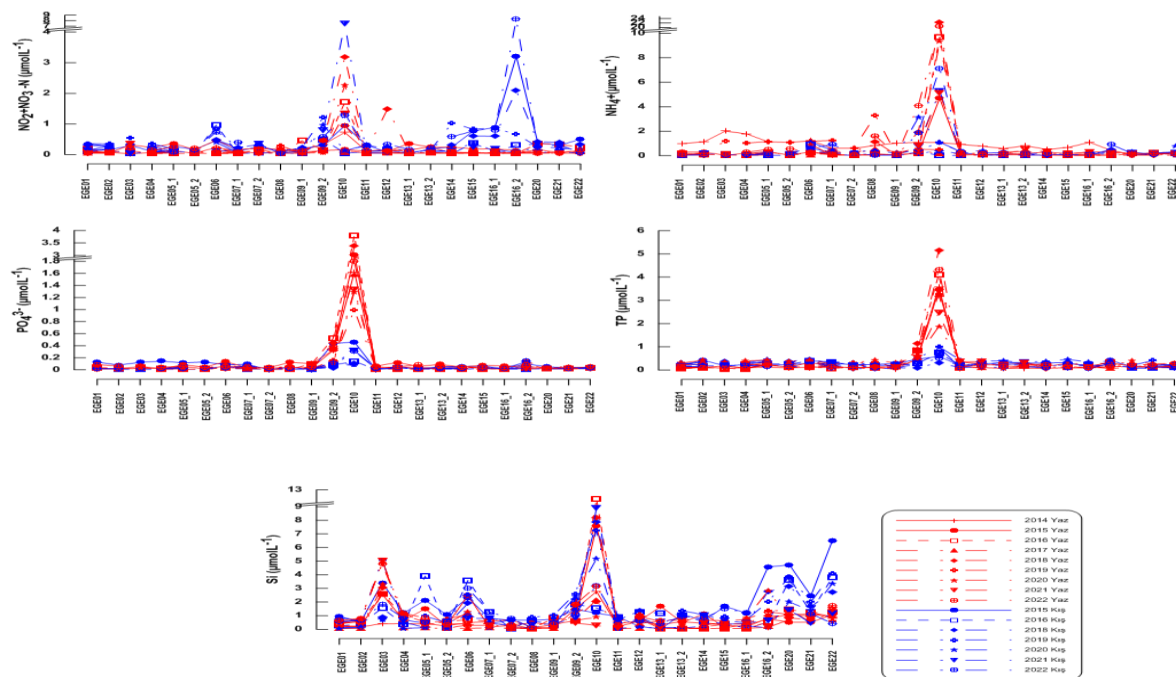
Source: ÇŞİDB-ÇEDİDGM and TÜBİTAK-MAM (2022). Integrated Marine Pollution Monitoring Program (2020-2022). (Aegean Sea Final Report, 2022), 2022, Gebze-Kocaeli.

The highest values of dissolved inorganic nitrogen (nitrate+nitrite+ammonia) in the Black Sea between 2014 and 2022 were measured in the surface waters of the Black Sea, which are fed by the river inputs (Sakarya, Filyos, Kızılırmak and Yeşilırmak) whose flows increased with increasing precipitation in the winter season. In summer, the lowest rates were found at TRKSK1 station, where PO43--P and TP concentrations were generally high, and at TRK39 station influenced by Yeşilırmak River (Graph 69).

Graph 69- BLACK SEA SURFACE WATER NUTRIENTS 2014-2022 COMPARISON
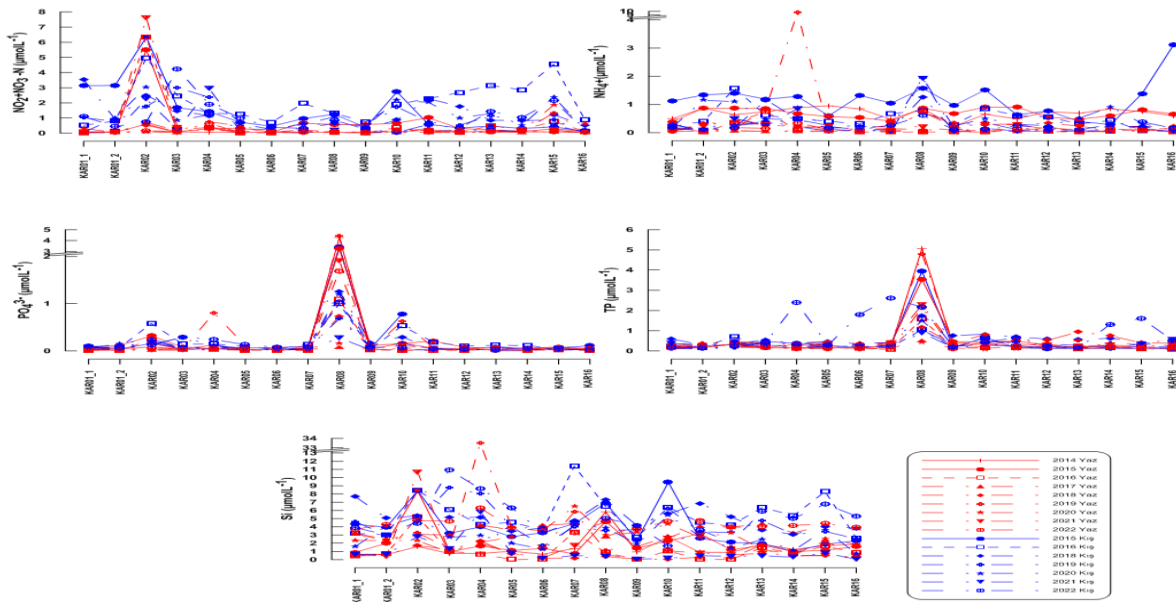
Source: ÇŞİDB-ÇEDİDGM and TÜBİTAK-MAM (2022). Integrated Marine Pollution Monitoring Program (2020-2022). (Black Sea Final Report, 2022), 2022, Gebze-Kocaeli.

In the Sea of Marmara, phosphorus compounds were measured at the highest level in MAR04 (Bandırma Bay) in all seasons, indicating the continuous presence of industrial and domestic pressures. Apart from this, high phosphorus compounds were observed in the regions influenced by Susurluk (MRM01-02- 03- 21). Dissolved Inorganic Nitrogen (nitrate+nitrite+ammonia) was measured at high concentrations in the CWBs representing Istanbul and Izmit Bays, Gemlik Bay (MRM18, MRM19_1), Susurluk River coast (MRM01) (Graph 70).

Graph 70-MARMARA SEA SURFACE WATER NUTRIENTS 2014-2022 COMPARISON
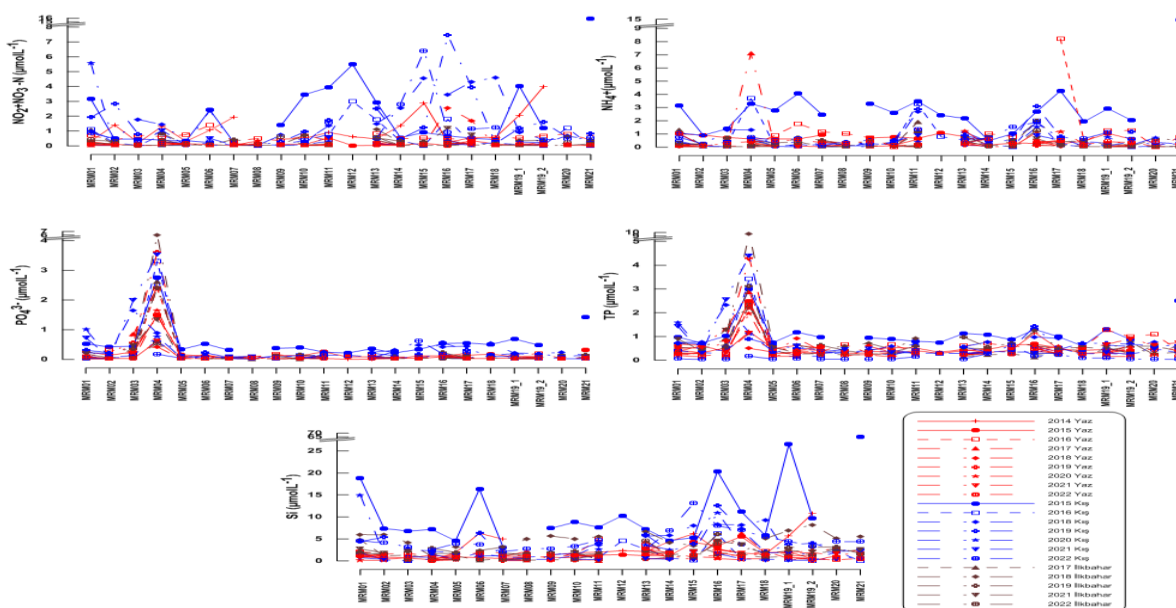
Source: ÇŞİDB-ÇEDİDGM and TÜBİTAK-MAM (2022). Integrated Marine Pollution Monitoring Program (2020-2022). (Marmara Sea Final Report, 2022), 2022, Gebze-Kocaeli.

6.6- Oxygen Concentrations in the Marine Waters

(I) (B) **(S)** (E) (T)

One of the most important indicators of environmental status is the amount of dissolved oxygen. In terms of ecosystem health, dissolved oxygen levels in intermediate and bottom waters are known to be at 4-5 mg/L levels. The gradual decrease in oxygen in the lower waters (in deep bottom waters and in the lower/bottom waters inside the gulfs) gradually increases the threat of the end of life and the formation of hydrogen sulfide.

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During the summer period in the Mediterranean Sea, surface water oxygen saturation levels were 95-112% and concentrations ranged between 6.0-7.0 mg/L (Graph 71).

The Aegean Sea DO values varied between 6.96-9.30 mg/L in the winter period and between 3.23 - 7.2 mg/L in the summer period, with an average value of 6.3 mg/L. At depths >200 m, the values are in the range of 5.0-7.0 mg/L (Graph 72).

In the Black Sea, DO (5-10 mg/L), which is highly variable from the surface to about 70 m depth, started to decrease after this layer (oxycline) (<14.5 sigma-t) (Graph 73).

Since the western part of the Sea of Marmara is under the influence of Mediterranean waters, the values of DO in the bottom layer of this region are relatively higher than those in the intermediate layer and bottom waters of other regions. However, in the intermediate layer and bottom waters of the gulf regions (depth <100 m) and especially in the bottom and sometimes intermediate layer waters of the northern sea stations (depth>200 m), dissolved oxygen values of <1 mg/L were always reached. These values can be as low as <0.5 mg/L in some places. (Graph 74).

Graph 71- DISSOLVED OXYGEN VALUES AND PERCENTAGE VALUES IN THE MEDITERRANEAN SEA BETWEEN 2014-2022
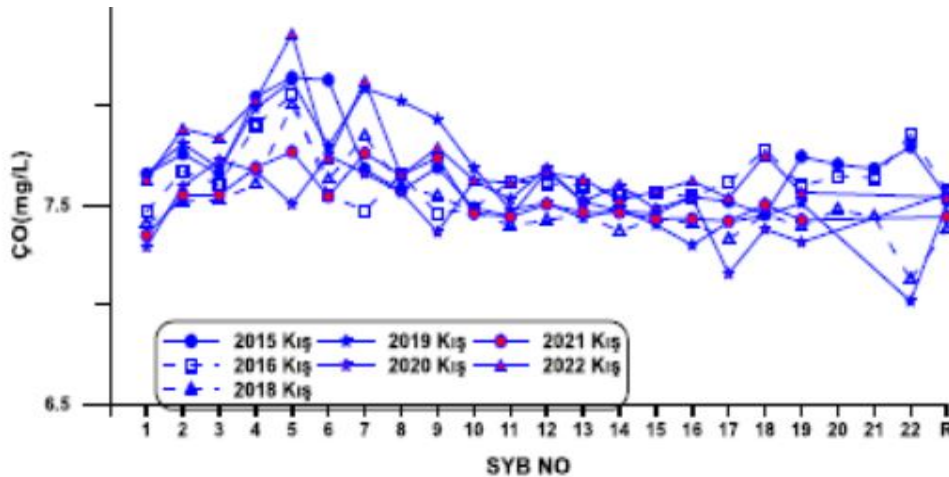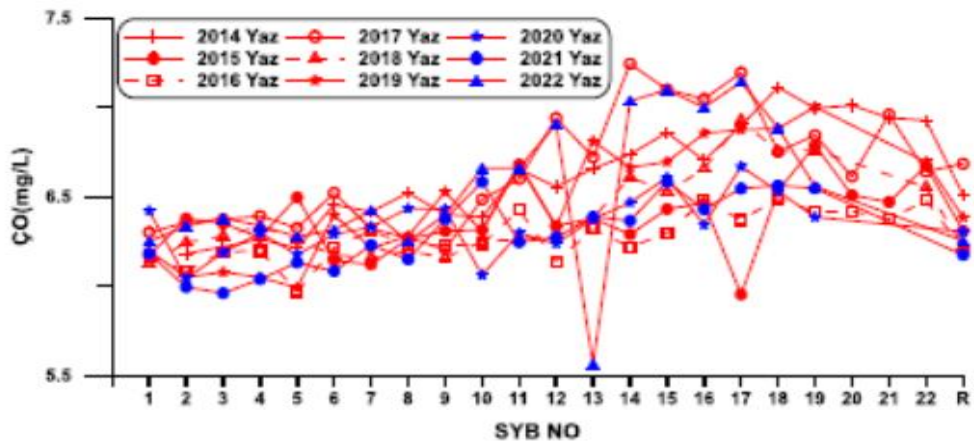
Graph 72- DISSOLVED OXYGEN VALUES AND PERCENTAGE VALUES IN THE EAGEAN SEA
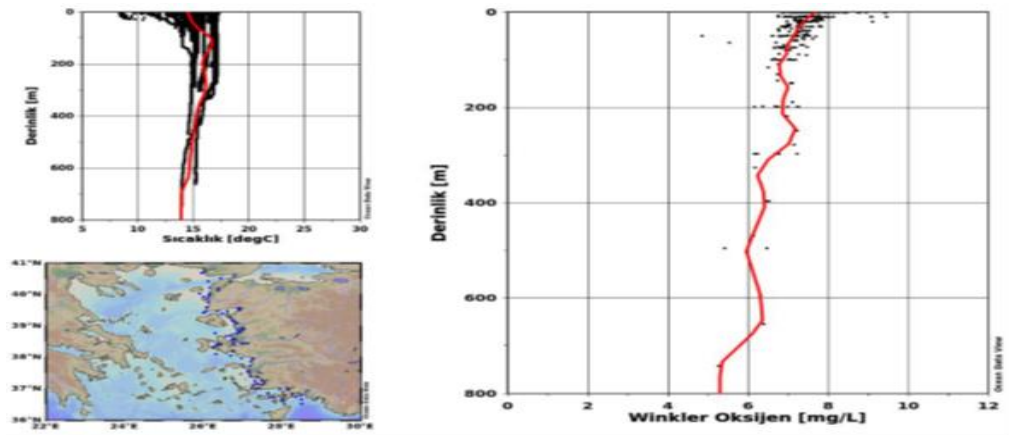
a) Winter Period
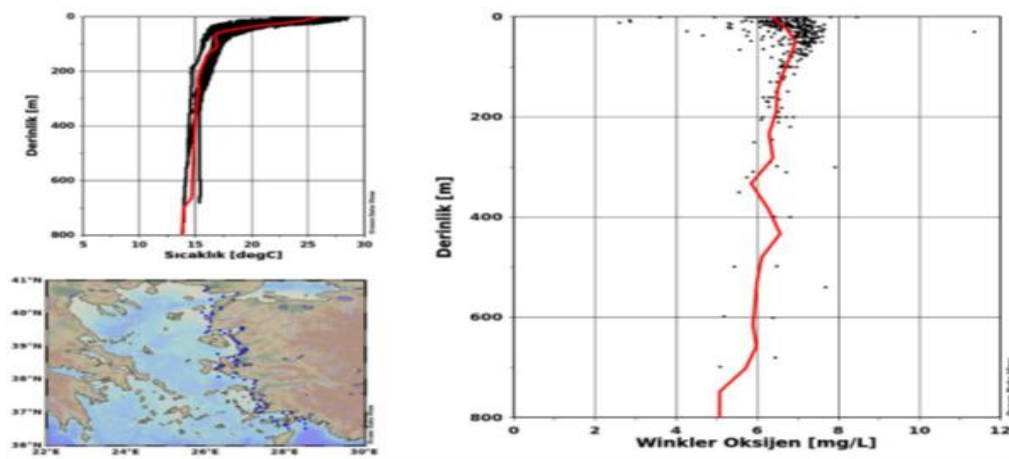
b) Summer Period

Graph 73- DISSOLVED OXYGEN PERCENTAGE VALUES IN THE BLACK SEA
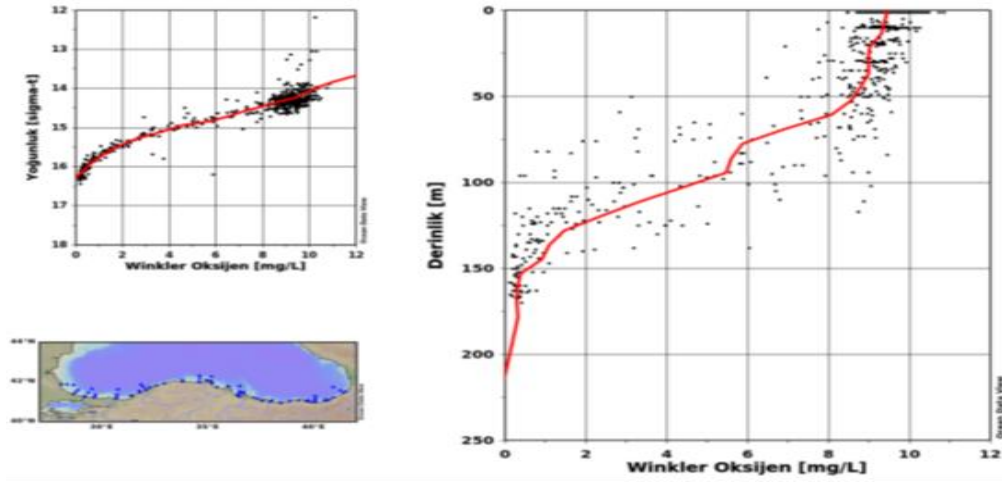
a)   Winter Period
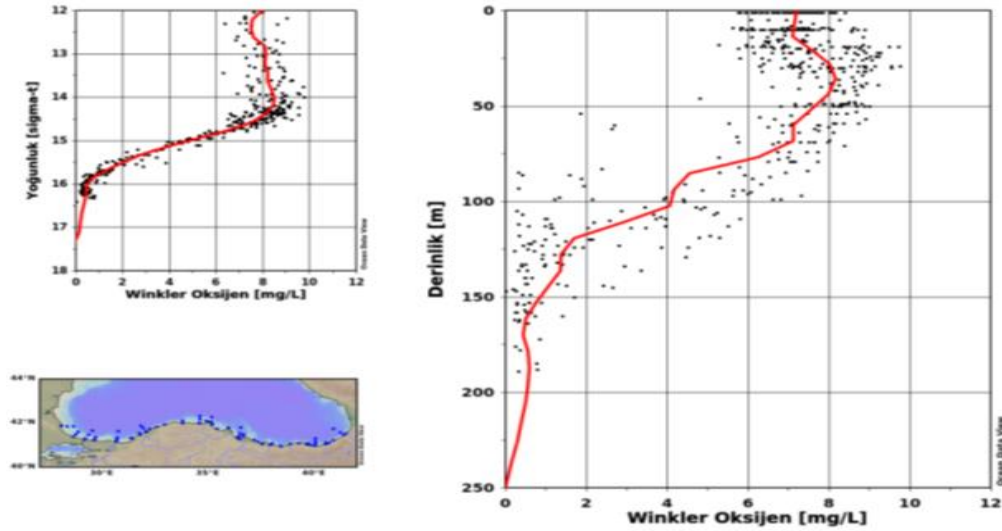
b)   Summer Period

Graph 74-MARMARA DENİZİ 2014-2022 YILLARI ARASI ÇÖZÜNMÜŞ YÜZDE DEĞERLERİ
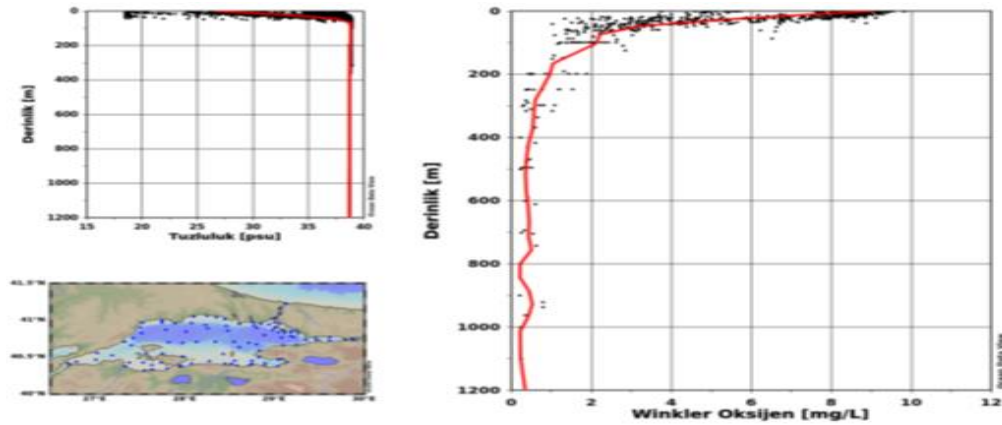
a)   Winter Period
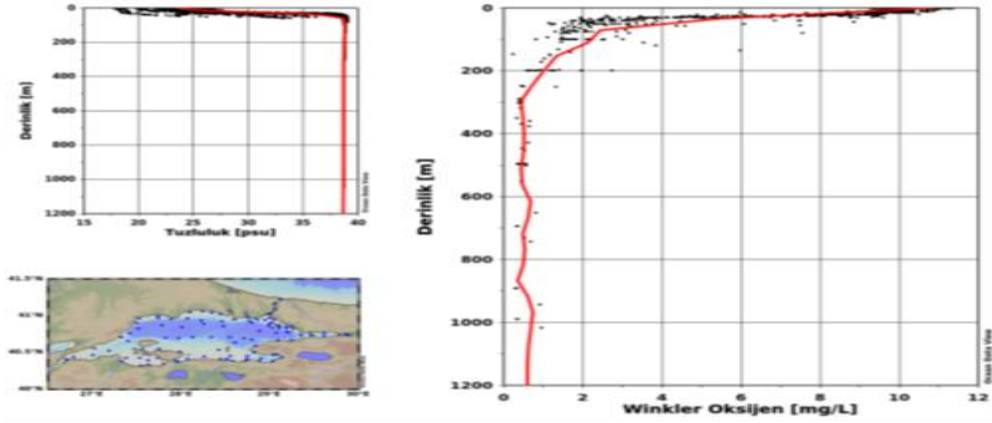
b) Summer Period

6.7- Bathing Water Quality

This indicator is a status indicator and shows the quality of bathing water in coastal areas. Bacteriological monitoring studies are carried out by the Ministry of Health General Directorate of Public Health in 35 provinces with sea and lake coasts during the swimming season every year in order to protect individual and public health. Samples are taken every 15 days from the monitoring points determined by the Ministry of Health. In 2022, 17,125 samples were taken from a total of 1471 bathing areas and analyzed microbiologically.

The "By-Law on the Management of Bathing Water Quality" prepared in line with Directive 2006/7/EC of the European Parliament and Council entered into force after being published in the Official Gazette dated 25.10.2019 and numbered 30899. While Total coliform, Fecal coliform and Fecal streptococcus parameters were monitored in swimming water in our country before 2020; Intestinal entrecocci and E.coli parameters are monitored according to the new Law.

During the 2022 season, monitoring results were evaluated in accordance with the provisions of the By-Law on the Management of Swimming Water Quality and bathing areas were classified as Excellent, Good, Adequate and Poor.
According to the results of the monitoring conducted in 2022, 1140 monitoring points were evaluated as excellent quality (79%), 165 monitoring points as good quality (11%), 86 monitoring points as adequate quality (6%), 54 monitoring points as poor quality (4%). 26 points were excluded due to insufficient samples[46].

Graph 75- QUALITY CLASSES (2022)
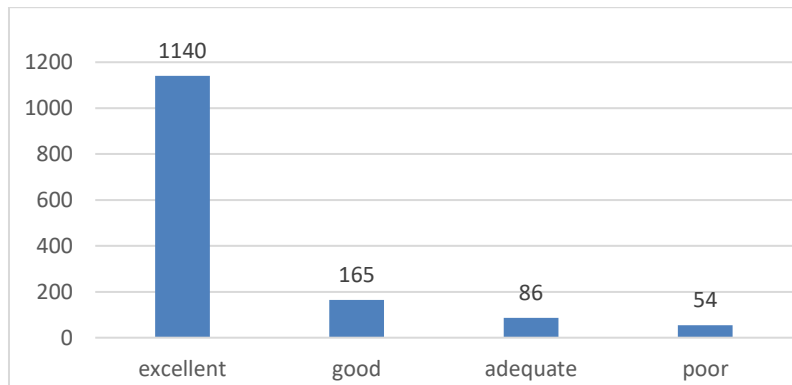
Graph 76-2022 QUALITY CLASSES BY REGION

Quality Classes by Region in 2022

	Central Anatolia	Eastern Anatolia	Black Sea	Marmara	Aegean	Mediterranean
■ Poor	0	3	23	21	4	3
■ Adequate	0	6	35	36	5	4
■ Good	0	27	60	56	12	10
■ Excellent	2	15	97	214	438	374
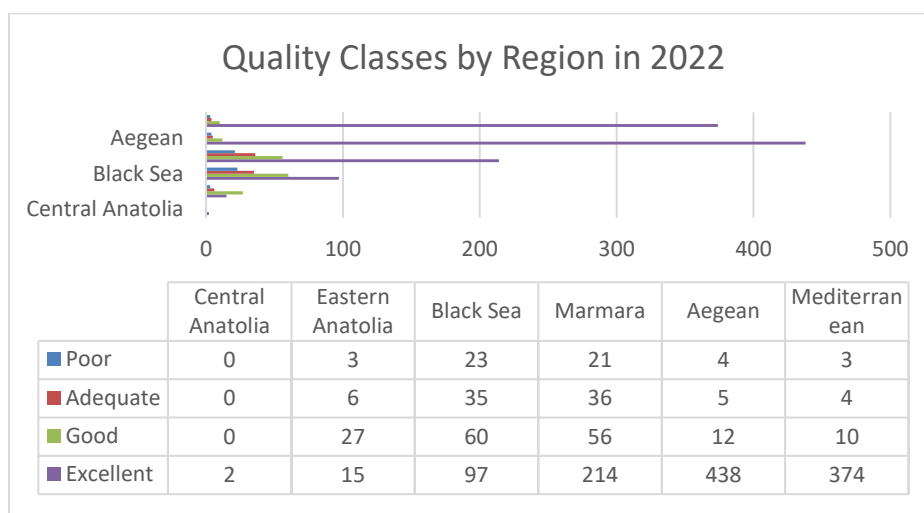
Source: Ministry of Health, General Directorate of Public Health, 2023

6.8. Drinking and Utility Water Supplies of Municipalities

The indicator shows the pressure on water resources. The most important and most used water supplies of municipalities is dams. In years when there is a decrease in precipitation, there may be a decrease in the proportion of water abstracted from dams and an increase in the proportion of water withdrawn from rivers, lakes and ponds for drinking and potable water use of municipalities. In Turkiye in 2022, 43% of the water abstacted for drinking and potable water supply was from dams, 29.1% from wells, 16.5% from springs, 7.7% from rivers and 3.7% from lakes-ponds/seas.

In 2022, the ratio of municipal population served by water supply network to total municipal population is 98.8% and the ratio of municipal population served by water supply water treatment plants to total municipal population is 63%.

While 3.24 billion m³ of water was withdrawn by municipalities for distribution through water supply networks in 1994, this figure increased to 4.56 billion m³ in 2022.

Of the total 6.7 billion m³ of water withdrawn to water supply networks, 4.1 billion m³ was treated in drinking and potable water treatment plants. Conventional treatment was applied to 90.4%, advanced treatment to 9.6% and physical treatment to 0.03% of the treated water[47].

Graph 77- DISTRIBUTION OF WATER ABSTRACTED FOR MUNICIPAL WATER SUPPLY NETWORK ACCORDING TO SOURCES
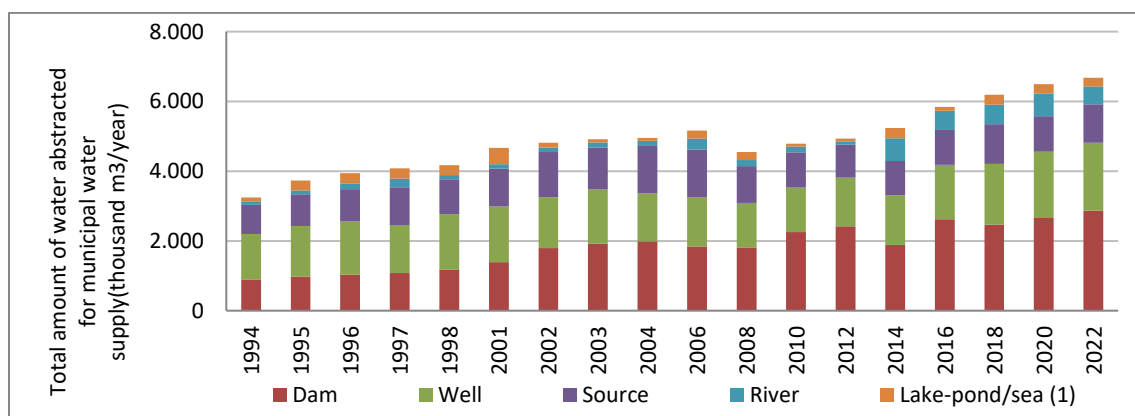
Since 2010, the amount of water abstracted from the sea has been included.
Source: TURKSTAT, "Water and Wastewater Statistics Bulletin 2022"

6.9. Municipalities Served by Wastewater Treatment Plants

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The indicator is a response indicator and is important for monitoring the success of policies implemented to control pollution from domestic wastewater.

Wastewater treatment is an important practice for more efficient use of water and protection of existing resources. In 2022, the ratio of the municipal population served by wastewater treatment plants to the total municipal population is 77.7[48].

Graph 78- MUNICIPALITIES AND POPULATION SERVED BY WASTEWATER TREATMENT PLANTS (%)
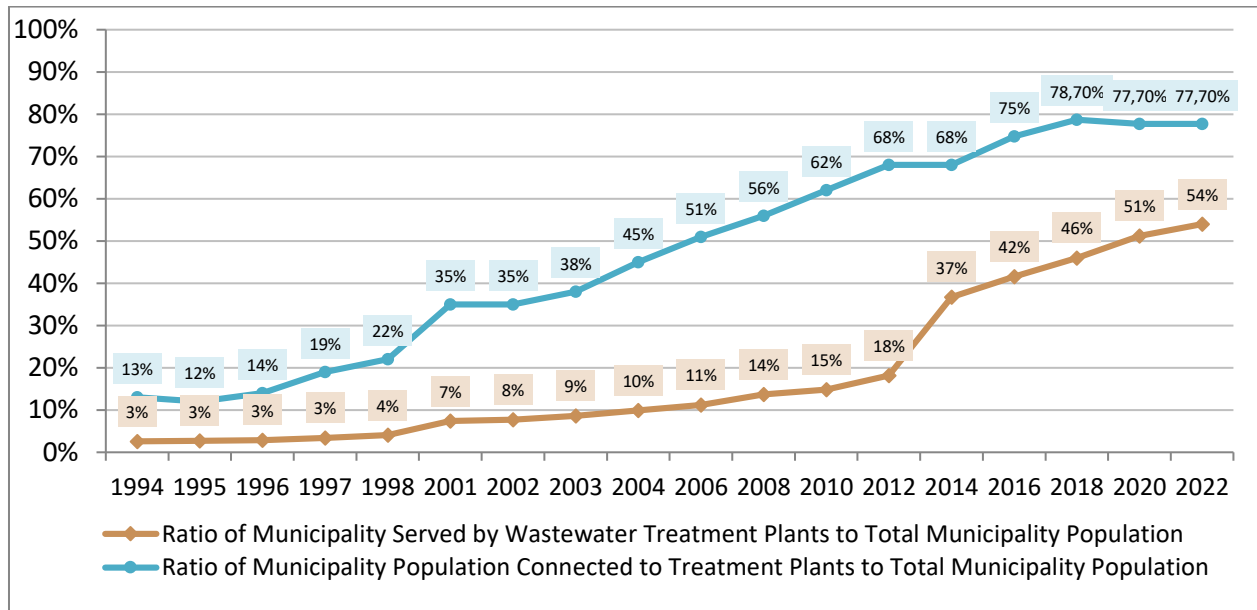
Source: TURKSTAT, "Water and Wastewater Statistics, 2022"

The total number of wastewater treatment plants, which was 145 in 2002, reached 1315 by the end of 2022. Looking at the distribution of these facilities; 20% of the wastewater treatment plants in our country were advanced, 51% were biological, 5% were physical and 24% were natural.

Graph 79-DISTRIBUTION OF WASTEWATER TREATMENT PLANTS BY TYPE -2022
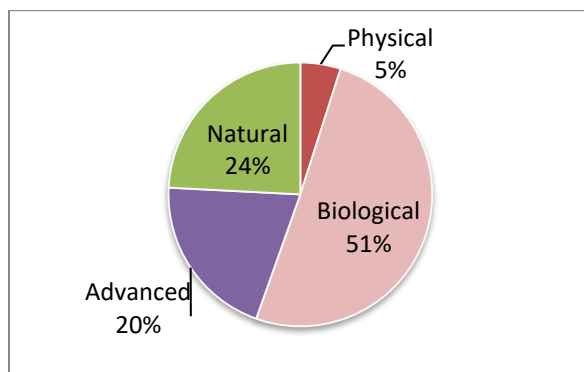
Source: TURKSTAT, "Water and Wastewater Statistics, 2022"

According to TURKSTAT data; in 2022, 52.7% of wastewater treated in Turkiye was advanced, 25.2% was biological, 21.7% was physical and 0.4% was natural[49].
According to TURKSTAT data, 348 thousand tons of wastewatersewage sludge (on dry matter basis) was generated in Turkiye in 2022 as a result of wastewater treatment processes.

In general, the high energy requirements of wastewater treatment plants increase operating costs and negatively affect the operation of the plant. In this context, the Ministry of Environment, Urbanization and Climate Change provides Energy Incentive Reimbursement Certificates to the facilities whose applications are approved in accordance with the "Law on the Procedures and Principles to be followed in Benefiting from Incentive Measures for Wastewater Treatment Plants" in order to cover 50% of the energy costs of wastewater treatment plants. In this regard, in order to ensure the efficient operation of wastewater treatment plants and to improve the water quality of receiving environments, the Ministry of Environment, Urbanization and Climate Change made support payments of approximately 231.4 million TL to 795 plants in 2022.

Graph 80- ENERGY INCENTIVEs FOR WASTEWATER TREATMENT PLANT
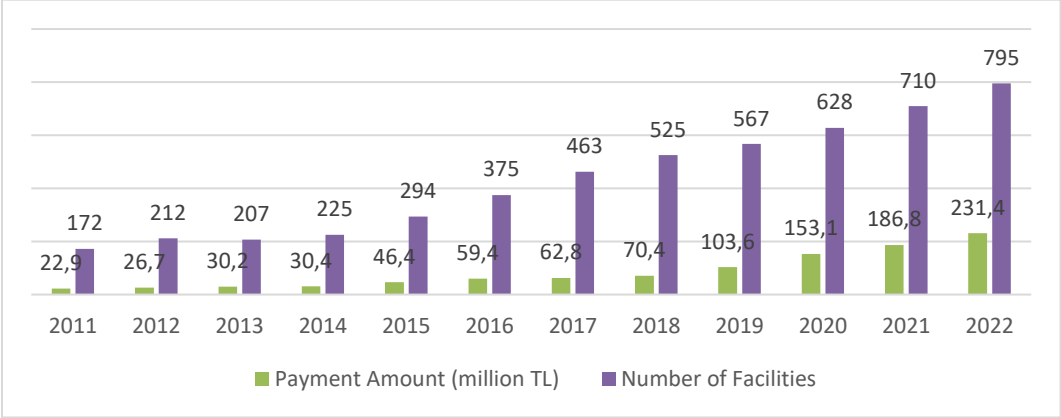
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Environmental Management, 2023

As a result of the Project for Determining the Current Status of Domestic / Urban Waste Water Treatment Plants Across the Country and Identifying the Need for Revision (TÜRAAT) carried out by the Ministry of Environment, Urbanization and Climate Change in 2016-2017, it was determined that waste water treatment plants (WWTPs) were not operated by competent persons and that these plants became idle or material and environmental losses occurred due to inefficient operation of the plants.

The "Communiqué on Technical Personnel Working in Wastewater Treatment Plants" prepared by the Ministry of Environment, Urbanization and Climate Change based on the Environmental Law No. 2872 in order to regulate the procedures and principles regarding the qualifications, certification, duties, powers and responsibilities of the technical personnel to be employed in order to eliminate the problems in idle and inefficient wastewater treatment plants and to ensure that these plants are operated effectively, efficiently and in accordance with the legislation, was published in the Official Gazette dated 23.05.2019 and numbered 30782 and entered into force.

Within the scope of the said declaration, candidates who complete the trainings regularly given by the Ministry of Environment, Urbanization and Climate Change every year for the operation of wastewater treatment plants and who are successful in the exams held afterwards are entitled to receive a facility responsible certificate, and it is aimed to prevent the operational problems experienced in wastewater treatment plants by employing the facility responsible, technical responsible and other technical personnel included in the said declaration by the wastewater infrastructure administrations.

As of the end of 2022, 5 certification periods including application, training and examination processes for Wastewater Treatment Plant Facility Supervisors have been realized and a total of 6600 facility supervisor certificates that can be used in municipal and industrial wastewater treatment plants have been issued.

Graph 81- Number of Waste Water Treatment Plant Facility Supervisor Trainings and Certificates

	2020	2021	2022
■ NUMBER of CERTIFICATES	974	1539	4087
■ NUMBER of TRAININGS	1	1	3
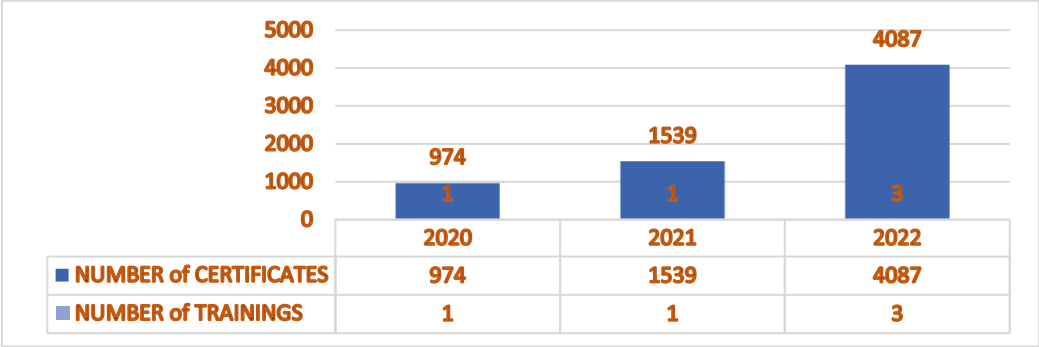
6.10- Population Served by Sewerage System

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The indicator is a response indicator and is the ratio of municipal population served by sewerage network to total municipal population.

As of 2022, the share of municipal population served by sewerage network in total municipal population is 92.8%. As of 2022, the total number of municipalities is 1391, of which 1366 (98% of municipalities) are served by sewerage network.

The average daily per capita amount of wastewater discharged by municipalities through the sewerage network increased from 126 liters in 1994 to 197 liters in 2022[50].

Graph 82- RATE OF POPULATION AND MUNICIPALITIES SERVED BY SEWERAGE SYSTEM (%)
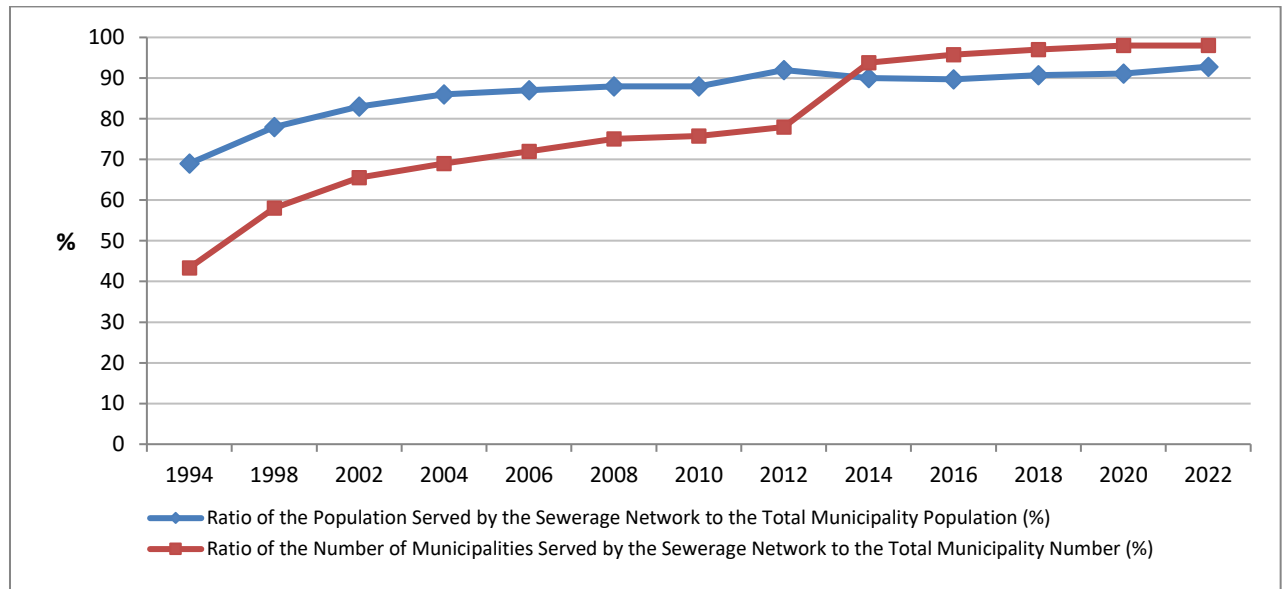
Source: TURKSTAT, "Water and Wastewater Statistics, 2022"

Table 12- PROPORTION OF POPULATION AND MUNICIPALITIES SERVED BY SEWERAGE SYSTEM (%)

YILLAR	1994	1998	2002	2004	2006	2008	2010	2012	2014	2016	2018	2020	2022
Rate of Population Served by Sewerage Network in Municipal Population (%)	69	78	83	86	87	88	88	92	90	90	90,7	91,1	92,8
Ratio of Number of Municipalities Served by Sewerage Network to Total Number of Municipalities (%)	43	58	66	69	72	75	76	78	94	96	97	98	98
Average Daily Amount of Wastewater Discharged per Person (liters/person-day)	126	154	154	174	181	173	182	190	181	183	188	189	197

Source: TURKSTAT, "Water and Wastewater Statistics, 2022"

7
WASTE

7.1- Amount of Municipal Waste and Disposal Amount

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In line with the general principles of waste management, wastes should be directed primarily towards prevention of generation, reduction at source, reuse, material recovery, energy recovery and finally disposal. Waste generation quantities are pressure indicators, while their collection, disposal and recovery quantities are response indicators.

In order to ensure the protection and development of our natural resources and ecosystems and the creation of a healthy and livable environment for current and future generations by the Ministry of Environment, Urbanization and Climate Change; National Waste Management and Action Plan (NWMP) covering the years 2016-2023 was prepared within the framework of the principle of sustainability, taking into account international norms and national priorities, within the framework of the responsibility to develop strategies and legislation, to determine policies and strategies on minimization of wastes at source, classification, collection, transportation, temporary storage, recovery, disposal, reuse, processing, conversion into energy and final storage of wastes.

NWMP revision studies for the years 2023-2035 were completed in order to harmonize the existing management plans with the zero waste management plan, to increase and expand the efficiency of separate collection at source, and to set targets for waste recovery, recycling and energy generation needed within the framework of circular economy principles. According to the National Waste Management and Action Plan, it is targeted that 35% of the waste generated in 2023 will be recovered and 65% will be disposed by landfilling. According to the Ministry of Environment, Urbanization and Climate Change, this figure is currently 30.13% in Turkiye[51].

According to EUROSTAT 2021 data; while the average of EU-27 countries in terms of the annual amount of municipal waste generated per capita is 530 kg, the TURKSTAT data for 2020 in our country is 412.45 kg[52].

By 2021, the recycling rate for municipal waste was 49%, the average for EU-27 countries[53].

Graph 83- AMOUNT OF MUNICIPAL WASTE COLLECTED BY YEAR

	1994	1996	1998	2002	2004	2006	2008	2010	2012	2014	2016	2018	2020	2022
■ Collected Municipal Waste	17,8	22,5	25	25,4	25	25,3	24,4	25,3	25,9	28,0	31,5	32,2	32,3	30,2
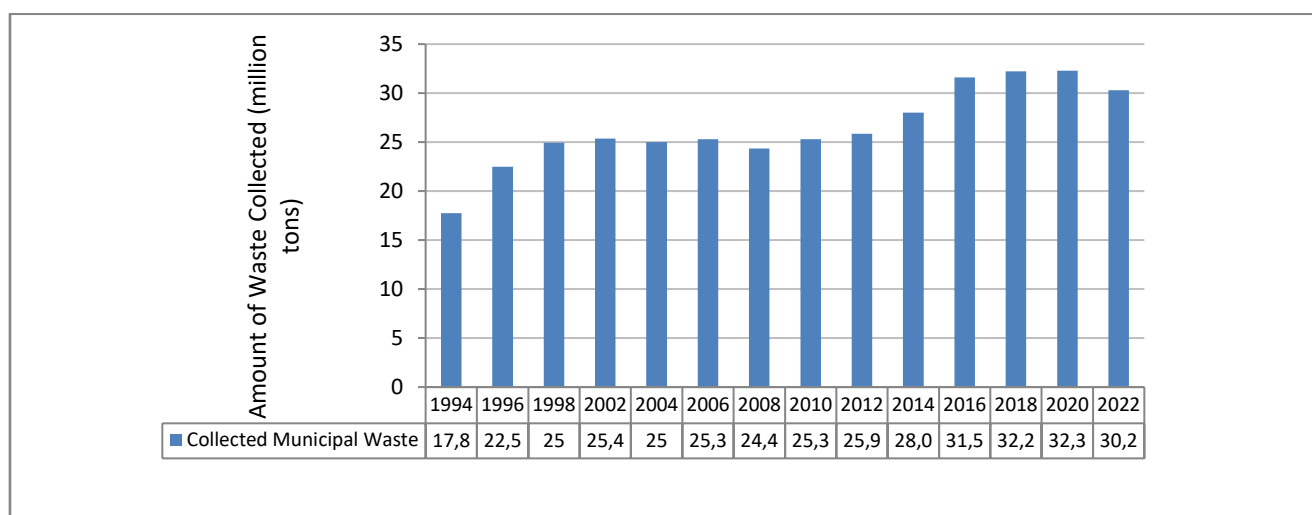
Source: TURKSTAT,"Waste Statistics Bulletin 2022"

7.2- Number of Landfills - Number of Municipalities - Population Served with Landfills

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As a result of the efforts to establish municipal waste landfills in Turkiye, the number of landfills increased from 15 in 2003 to 38 in 2008, 46 in 2010, 79 in 2014, 81 in 2015, 84 in 2016, 87 in 2017, 88 in 2018 and 91 in 2021. As of 2022, 93 facilities serve a population of 69.5 million in 1241 municipalities. According to 2022 data from the Ministry of Environment, Urbanization and Climate Change, the ratio of the population served by landfills to the total municipal population is 89%. By the end of 2023, it is aimed to upgrade all existing infrastructure facilities and increase the ratio of population served by waste disposal to 100%.

Graph 84- NUMBER OF MUNICIPALITIES AND RATE OF POPULATION SERVED WITHBY YEARS (%)
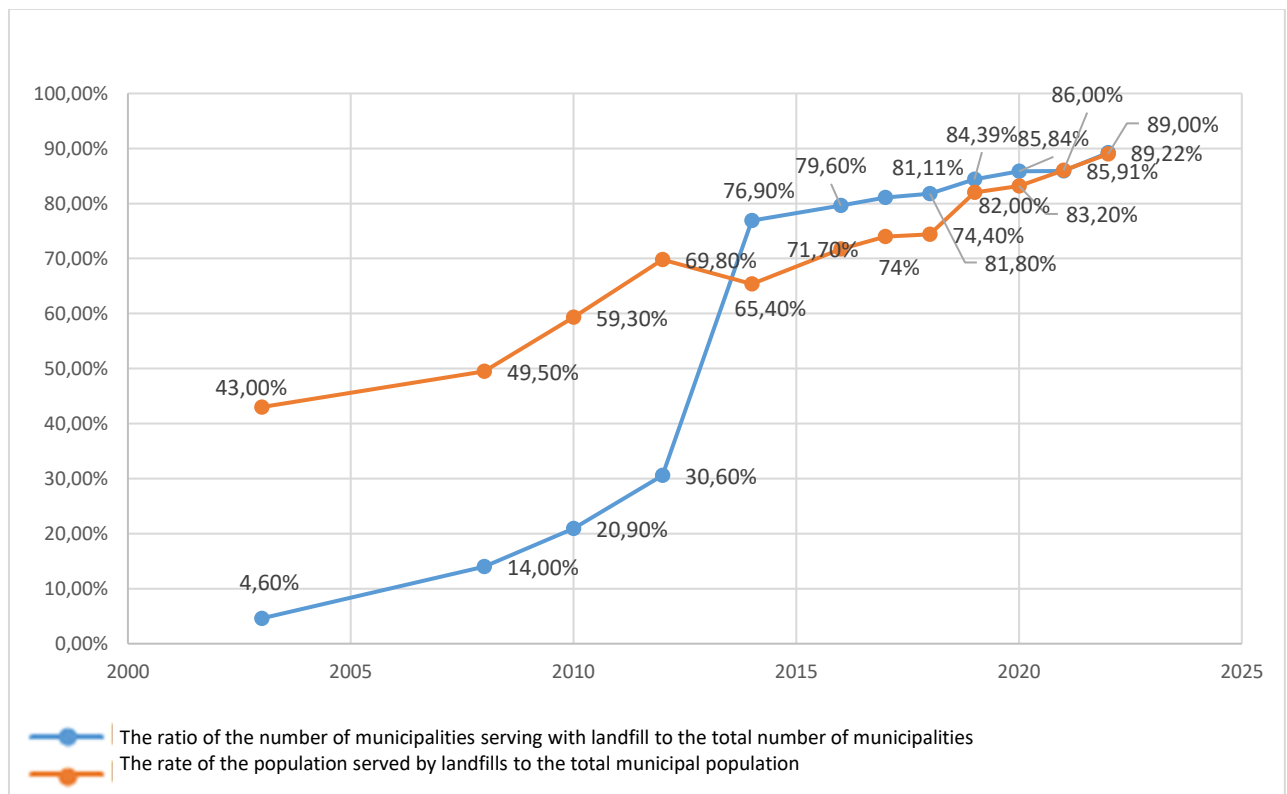
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Environmental Management, 2023

7.3- Hazardous and Non-Hazardous Wastes

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Waste is an important pressure factor indicator for environmental values.

Annual waste declarations under the By-Law on Waste Management are made by waste generators using the Waste Management Application/Waste Declaration System (TABS) under the Integrated Environmental Information System (ecbs.cevre.gov.tr) of the Ministry of Environment, Urbanization and Climate Change. Hazardous and non-hazardous waste data in TABS consists of the declarations made by waste generators and includes the information on hazardous and non-hazardous waste generated at the facility and sent to the waste treatment facility for recovery/disposal in the declaration year. Waste declarations reveal the amount of hazardous and non-hazardous waste in Turkiye. As of the end of 2021, 105.103 companies used the Waste Declaration System (TABS). The amount of hazardous waste declared by these companies for 2021 was 3.031.048 tons of hazardous waste and 29.635.926 tons of non-hazardous waste, totaling 32.666.974 tons. In 2021, 54% of the declared waste was sent to waste

processing facilities for recovery, while 43% was sent to sterilization, landfill and incineration facilities for disposal. However, 2% was recorded as stocks and 1% as exports.[54]

With the zero waste approach developed to reduce the use of raw materials and prevent waste generation, the concept of circular economy was implemented to contribute to the economy. On the other hand, the Communique on Waste Derived Fuel (WDF), Additional Fuel and Alternative Raw Materials was published in 2014 in order to use waste as raw material and resource. In addition, the By-Law on Waste Management aims to use by-products instead of raw materials, provided that they meet the necessary conditions. In 2022, a total of 3.7 MT of alternative raw materials and 2.1 MT of additional fuel were used in the cement, lime, ceramics, brick and iron and steel sectors.[55]

The table below shows the Recycling and Disposal facilities licensed by the Ministry under the Environmental Permit and License Law[56].

Table 13- LICENSED RECYCLING/DISPOSAL FACILITIES

Number of hazardous waste recovery facilities	500
Number of hazardous waste landfill facilities	14
Number of Waste Incineration and Co-incineration Plants	104
Number of facilities that obtained Temporary Activity Certificate and Environmental Permit and License Certificate for Biodegradable Waste Processing Biomethanization	67

Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of EIA, Permit and Inspection, 2023

Graph 85- WASTE DECLARATION SYSTEM DATA (2018-2021)

	2018	2019	2020	2021
Export amount	217.860	139.478	303.372	242.731
Stock quantity	1.916.855	4.601.820	645.949	837.222
Disposal amount	3.411.989	7.981.748	13.686.550	14.017.774
Recovery amount	11.035.553	12.605.373	15.074.363	17.569.247
Number of facilities declared	66.478	76.496	82.053	105.103
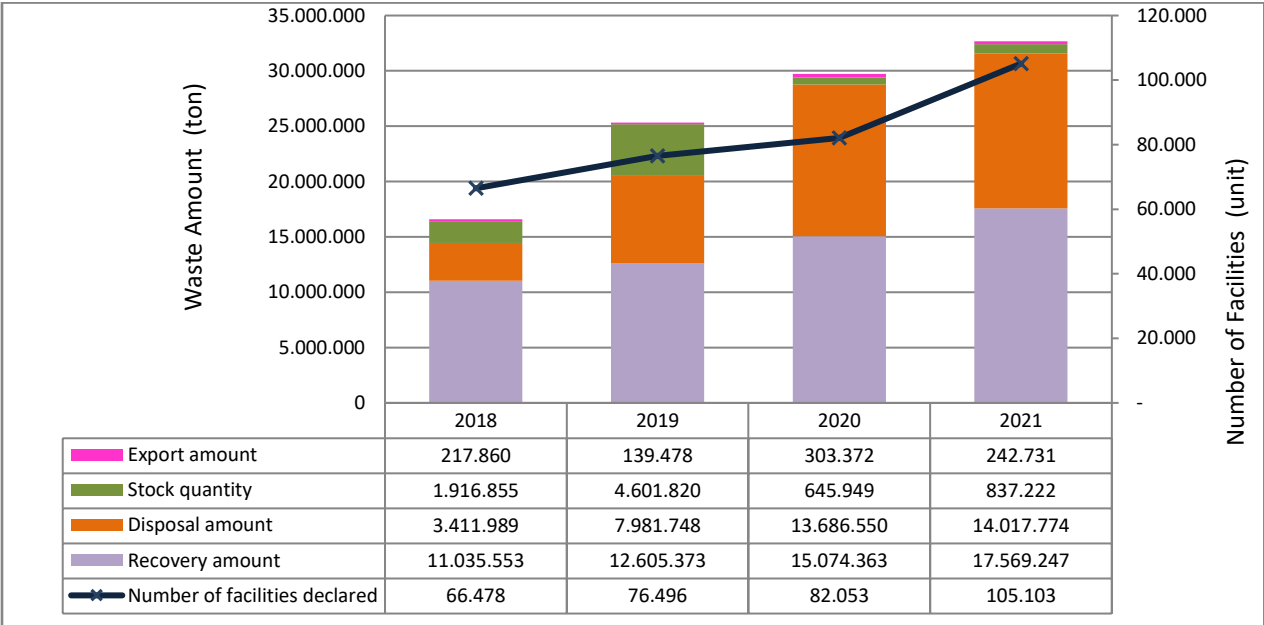
Table 14- WASTE DECLARATION SYSTEM DATA (2016-2021) (**)

YEARS	2016	2017	2018	2019	2020	2021
Number of facilities that made a declaration	60.233	63.741	66.478	76.496	82.053	105.103
Total amount of hazardous and non-hazardous waste (tons)	19.240.675	16.549.996	16.582.257	25.328.419	29.710.234	32.666.974

Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of EIA, Permit and Inspection, Waste Declaration System (TABS) data,2023
Notes:
These quantities do not include wastes (coded 01) generated during the exploration, extraction, operation, physical and chemical treatment of minerals in the waste list. And mixed municipalty waste (20 01 03)

7.4. Medical Waste

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For 2021, 17,935 facilities submitted declarations to the Waste Declaration System (TABS) and the total amount of medical waste declared is 135,869 tons. This figure constitutes 4.5% of the total amount of hazardous waste (excluding mining waste). Sterilization facilities and incineration facilities have been established in Turkiye since 2008 and have been successfully implemented to render medical waste harmless[57].

Graph 86- MEDICAL WASTE ACCORDING TO WASTE DECLARATION SYSTEM DATA (2013- 2021)
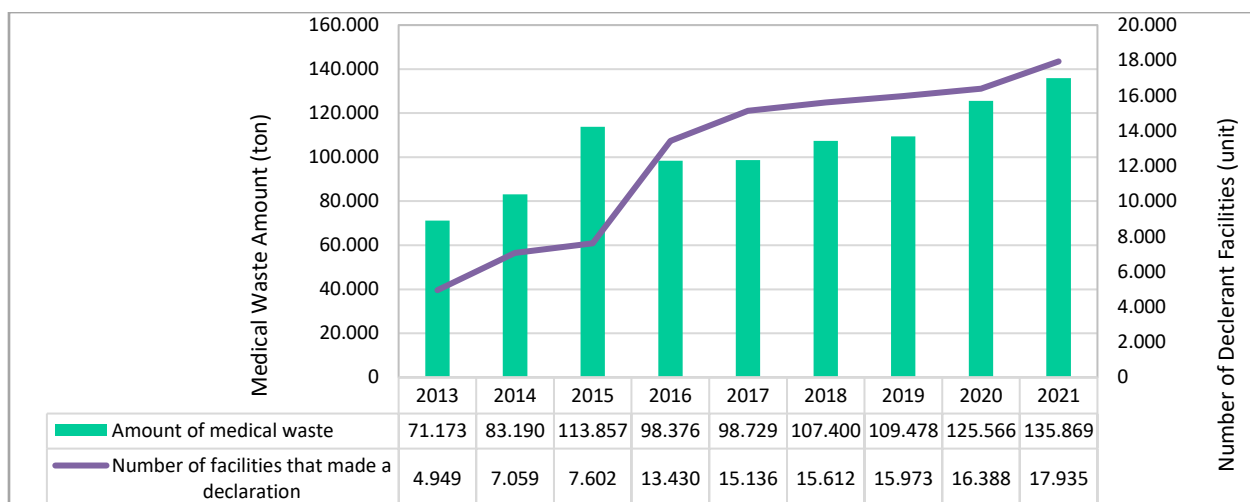
	2013	2014	2015	2016	2017	2018	2019	2020	2021
Amount of medical waste	71.173	83.190	113.857	98.376	98.729	107.400	109.478	125.566	135.869
Number of facilities that made a declaration	4.949	7.059	7.602	13.430	15.136	15.612	15.973	16.388	17.935

Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of EIA, Permit and Inspection, Waste Declaration System (TABS) data, 2023

7.5. Waste Oils, Vegetable Waste Oils, Waste Batteries andWaste Accumulators, Waste Electrical and Electronic Equipment, End-of-Life Tires and Enf-of-Life Vehicles

P D E T

Annual waste declarations under the By-Law on Waste Management (WMR) are made by waste generators using the Waste Management Application/Waste Declaration System (TABS) under the Integrated Environmental Information System (ecbs.cevre.gov.tr) of the Ministry of Environment, Urbanization and Climate Change. The waste data in TABS consists of the declarations made by waste generators and includes the waste information generated at the waste generator's facility in the declaration year and sent to the waste treatment facility for recovery/disposal. The amounts of waste oils, vegetable waste oils, waste batteries, waste accumulators, waste electrical and electronic equipment and end-of-life tires declared by waste generators to Waste Declaration System for the period 2013-2021 are given in Graph 87. The amounts of end-of-life vehicles registered in the End-of-Life Vehicles Disposal Tracking System (ELV System) of the

General Directorate of Environmental Management for the period 2013-2022 are given in Chart 88.

Graph 87- QUANTITIES OF WASTE OIL, WASTE VEGETABLE OIL, WASTE BATTERIES AND ACCUMULATORS, WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT, END-OF-LIFE TIRES (2013-2021)
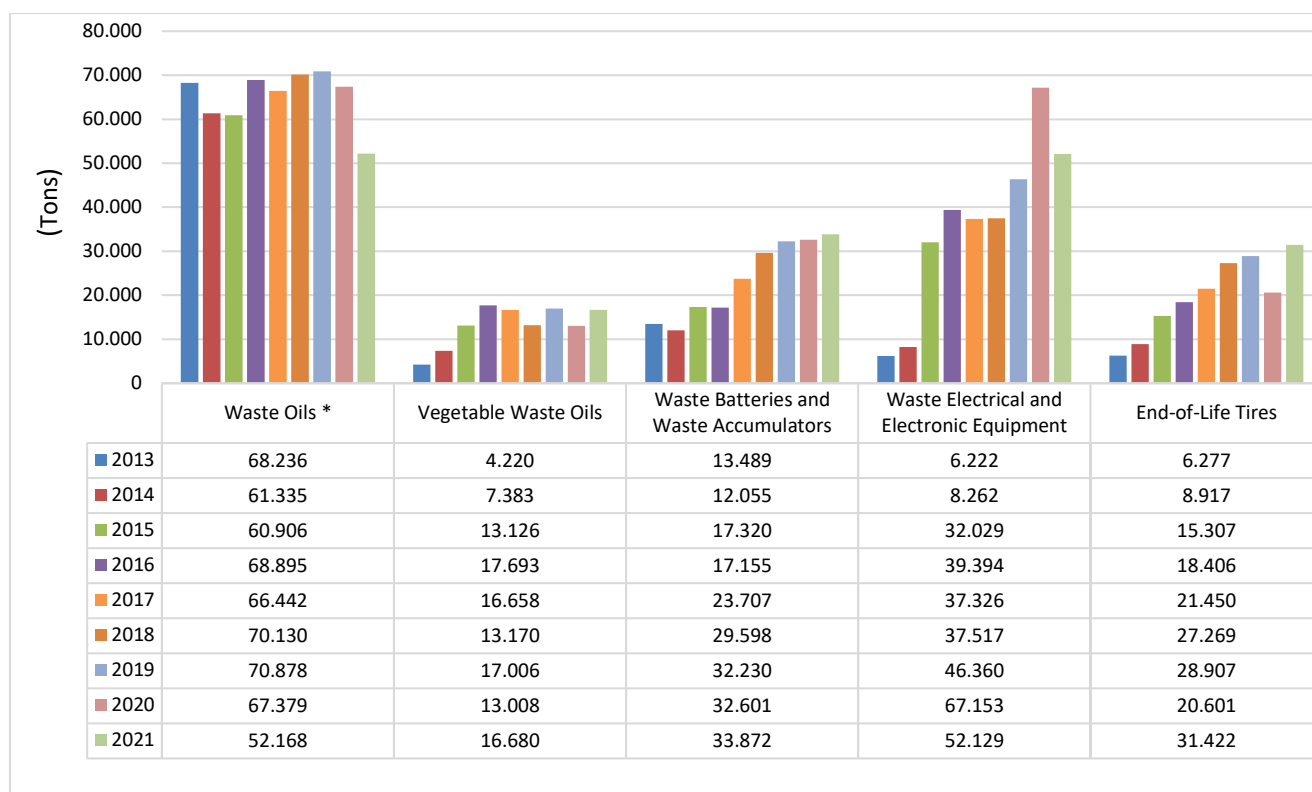
	Waste Oils *	Vegetable Waste Oils	Waste Batteries and Waste Accumulators	Waste Electrical and Electronic Equipment	End-of-Life Tires
2013	68.236	4.220	13.489	6.222	6.277
2014	61.335	7.383	12.055	8.262	8.917
2015	60.906	13.126	17.320	32.029	15.307
2016	68.895	17.693	17.155	39.394	18.406
2017	66.442	16.658	23.707	37.326	21.450
2018	70.130	13.170	29.598	37.517	27.269
2019	70.878	17.006	32.230	46.360	28.907
2020	67.379	13.008	32.601	67.153	20.601
2021	52.168	16.680	33.872	52.129	31.422

Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of EIA, Permit and Inspection, Waste Declaration System (TABS) data,2023

Notes

As of 2019, data has been updated by including hazardous and non-hazardous waste codes in waste groups.

*Starting from 2021, the waste list in the annex of the Law on Amendment to the Law on Waste Oil Management published in the Official Gazette dated 23/12/2020 and numbered 31343 will be used for the Waste Oils group.

Graph 88- NUMBER OF VEHICLES WITH VEHICLE DEREGISTRATION AND DISPOSAL FORMS (2013- 2022)
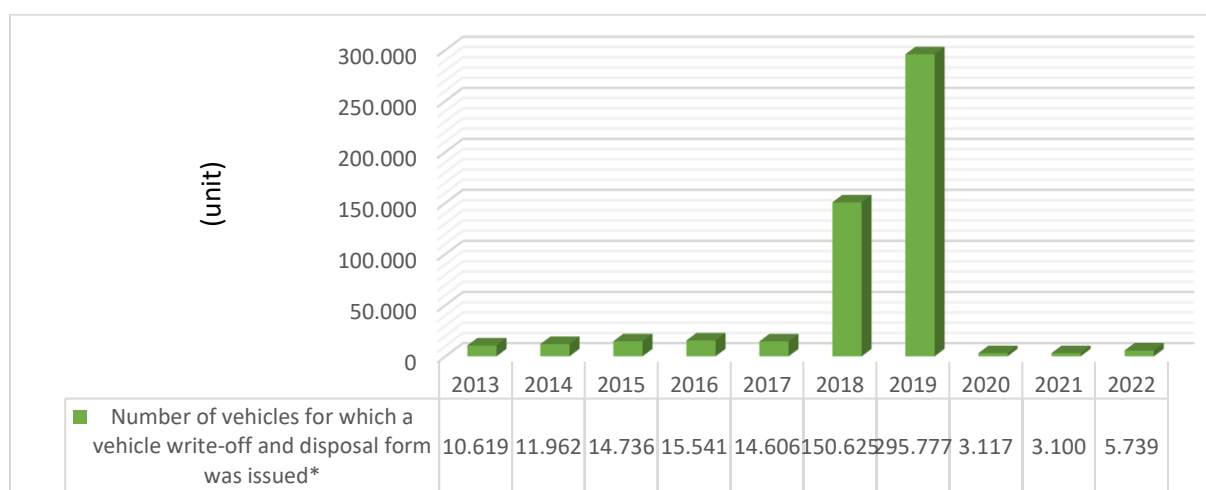
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Number of vehicles for which a vehicle write-off and disposal form was issued*	10.619	11.962	14.736	15.541	14.606	150.625	295.777	3.117	3.100	5.739

Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Environmental Management, End-of-Life Vehicles Disposal Tracking System (ELV System) 2023

Note: Between 27.03.2018 and 31.12.2019, a scrappage incentive scheme was implemented to reduce Special Consumption Tax on new vehicles.

7.6. - Mining Waste

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According to TURKSTAT data, 26.3 million tons of waste excluding stripping material / waste was generated in mining operations in 2022. Mineral wastes constitute 99.99% of the 860.6 million tons of total waste, including stripping material / waste.

In 2022, the distribution of total mining waste by recovery and disposal methods shows that 76.1% was disposed of in tailings dumps, tailings dams or landfills, 20.9% was backfilled into the pit, and 3% was recovered or disposed of by other methods[58].

Table 15- NUMBER OF MINING WASTE LANDFILLS

YEARS	2011	2012	2013	2014	2015	2016	2017	2018	2020	2021	2022
Number of Mine Waste Landfill Facilities	6	17	25	32	34	36	39	51	61	67	72

Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Environmental Management, 2023

Graph 89- TOTAL AMOUNT OF MINING WASTE BY YEARS

	2010	2012	2014	2016	2018	2020	2022
Total Amount of Mining Waste	729.750	951.782	755.218	811.056	812.000	896.448	860.563
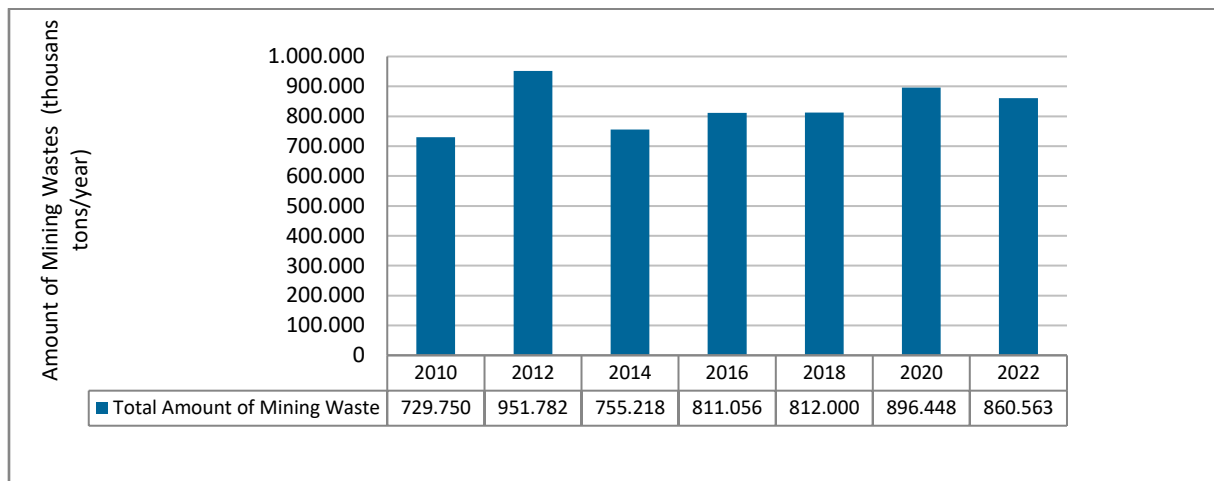
Source: TURKSTAT, "Waste Statistics 2022"

7.7- Packaging Waste

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According to the polluter pays principle in the By-Law on Control of Packaging Waste (CPW), the responsibility of covering the costs of collection of packaging waste is given to the enterprises that place their products on the market in packaging and it is of great importance to register these enterprises. Within the scope of the By-Law on Control of Packaging Waste , "Packaging Information System" has been established by the Ministry in order to create an inventory of packaging and packaging waste. The results of the data received from the users who entered data into the packaging information system regarding the amount of packaging produced and placed on the market, the types of packaging placed on the market based on their intended use and the ratios according to their intended use are given in Graph-90 and Table 16. The amounts of packaging wastes declared by waste generators in the Waste Management Application waste declaration system in 2021 are given in Graph -91 below.

Graph 90- AMOUNT OF PACKAGING PLACED ON THE MARKET BY YEAR ACCORDING TO THE PACKAGING INFORMATION SYSTEM
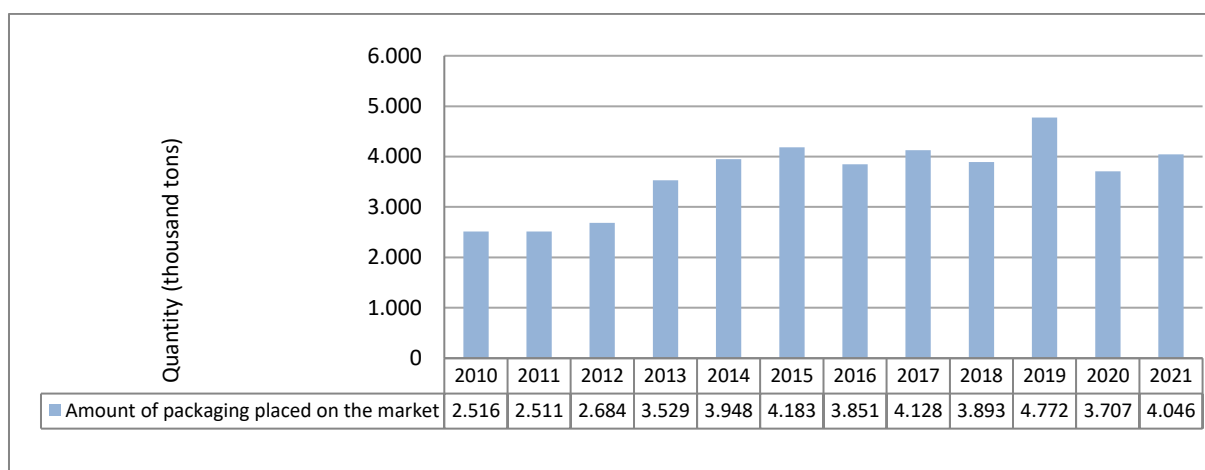
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
■ Amount of packaging placed on the market	2.516	2.511	2.684	3.529	3.948	4.183	3.851	4.128	3.893	4.772	3.707	4.046

Source: 2021 Packaging Bulletin, Ministry of Environment, Urbanization and Climate Change, 2023

Graph 91-2021 Packaging Waste Amount (Tons)
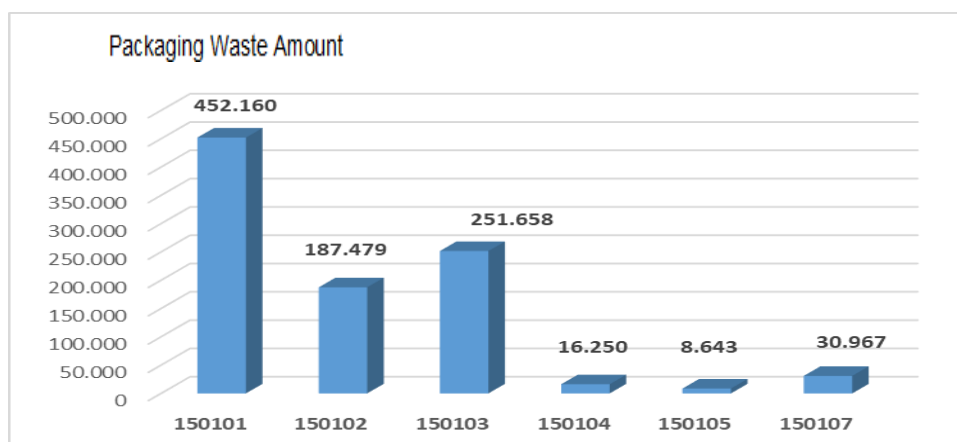
Source: 2021 Waste Statistics Bulletin, Ministry of Environment, Urbanization and Climate Change, 2023

Table 16-2021 PRODUCED, MARKETED PACKAGING AND PACKAGING WASTE RESULTS

Waste Code	Type	Packaging produced (tons)	Marketed under B-1 (tons)	Marketed under B-2 (tons)
15.01.02	PLASTIC	2.785.429	1.037.925	87.160
15.01.04	METAL	544.794	139.801	117.672
15.01.05	COMPOSITE	167.946	97.249	6.348
15.01.01	PAPER CARDBOARD	3.556.185	1.225.257	34.438
15.01.07	GLASS	1.937.861	810.482	19.640
15.01.03	WOOD	736.842	736.215	1.765
	TOTAL	9.729.057	4.046.930	267.022

(1)   B-1: Packages whose disposal is carried out within the framework of the CPW Law
(2)   B-2: Packages whose disposal is carried out within the framework of legislation other than the CPW Law
(3)   C: Packages placed on the market with deposit under the AAK Law
(4)   Source: 2021 Packaging Bulletin, " Ministry of Environment, Urbanization and Climate Change, 2023
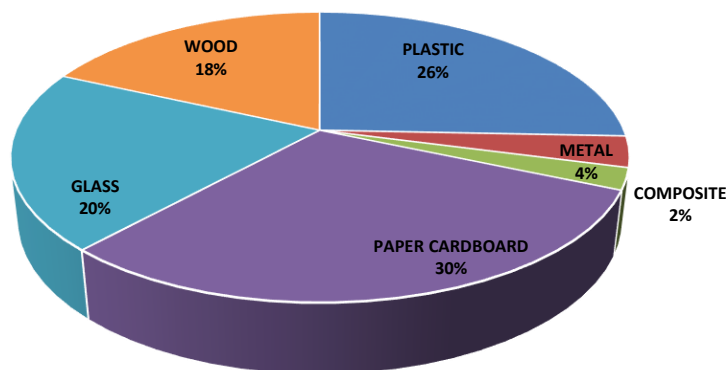
Source: 2021 Packaging Bulletin, Ministry of Environment, Urbanization and Climate Change, 2023

Municipalities prepare and submit their packaging waste management plans to the Ministry in order to specify by whom, how, how and when the collection, collection and transportation of packaging wastes separately from other wastes at the source will be carried out. Graph-93 shows the number of municipalities that prepared and submitted their plans to the Ministry in line with the packaging waste management plan format within the scope of these studies, which were first initiated in 2008, and whose plans were approved. However, it is stipulated in the By Law on Control of Packaging Wastes published on June 26, 2021 that the existing packaging waste management plans will end with the transition of local administrations to the zero waste management system in accordance with the transition schedule stipulated in the Zero Waste By Law, and packaging wastes will be collected in accordance with the zero waste management system practices and Provincial Zero Waste Management System Plans based on the provisions of the Zero Waste By Law.

Since 2012, the Packaging Statistics newsletter includes data on packaging producers, marketers, suppliers, licensed enterprises that collect-separate and recycle/recover packaging waste, packaging produced, imported, exported, exported, supplied, packaging placed on the market, packaging waste collected-separated and recycled, and packaging waste management in municipalities..

Graph 93- NUMBER OF MUNICIPALITIES WITH APPROPRIATE PACKAGING WASTE MANAGEMENT PLAN
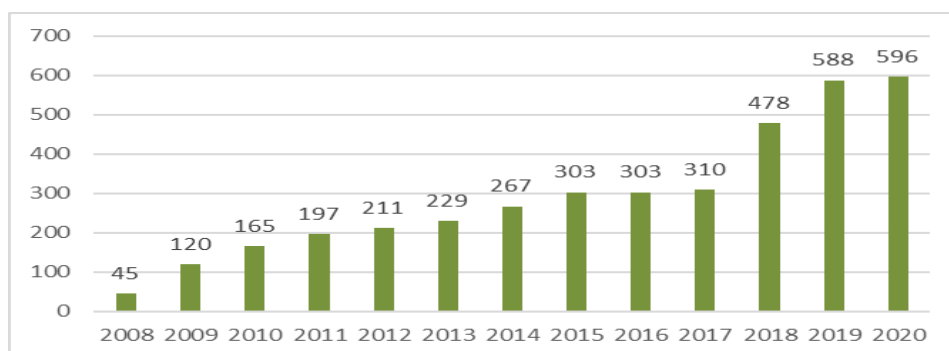
Source: 2020 Packaging Bulletin, Ministry of Environment, Urbanization and Climate Change, 2022

7.8- Ship-Sourced Waste

 (i) (P) (D) (E) (T)

In line with the "International Convention for the Prevention of Pollution of the Seas by Ships" (MARPOL 73/78), to which Turkiye is a party, and the National Legislation, waste reception facilities are established and operated in order to prevent the discharge of wastes and cargo residues produced by ships in maritime jurisdictions and to protect the marine environment. As of 2022, the number of coastal facilities providing ship waste reception services in Turkiye is 334.

Wastes collected at port waste reception facilities are sent to recycling/recycling centers according to their types within the scope of the applicable legislation published in accordance with the Environmental Law. Thus, ship-borne pollution caused by increasing maritime traffic is prevented at the source.

Graph 94- DISTRIBUTION OF SHIP-SOURCED WASTESBY YEARS (m³)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Oil and Oil Derived Wastes (m3)	299.96	264.95	173.57	129.48	286.71	359.50	343.58	203.04	240.04	388.31	236.00	524.03	315.32	504.79	416.37	516.53
Sewage	25.481	15.934	12.777	11.947	17.583	335.53	141.69	453.71	206.42	58.950	81.585	27.331	85.413	37.903	133.32	169.49
Garbage	88.038	29.950	18.653	23.977	25.255	43.177	41.039	44.007	40.067	33.872	24.514	37.494	163.98	76.527	52.034	82.881

Source: Ministry of Environment, Urbanisation and Climate Change, General Directorate of Environmental Management, 2023.

7.9- Zero Waste Management System

 (i) (B) (D) (E) (R)

The zero waste approach is an environmental movement set out with the aim of preventing and reducing waste generation, preventing waste, collecting and recycling waste separately at source, protecting our raw material resources and saving energy within the framework of sustainable development principles, and leaving a clean and developed Turkiye and a livable world to future generations.

Within the scope of the Zero Waste Project, the Zero Waste Law, which was prepared in order to adopt, implement and disseminate the zero waste approach throughout the country by determining the general principles and implementation principles regarding the establishment of the "Zero Waste Management System", was published in the Official Gazette dated 12.07.2019 and numbered 30829 and entered into force.

As of January 12, 2020, "Zero Waste Certificate" started to be given to local administrations that established the Zero Waste Management System. By the end of 2022, 95 Municipalities were given Basic Level Zero Waste Certificate .

Graph 95- NUMBER OF MUNICIPALITIES AWARDED WITH BASIC LEVEL ZERO WASTE CERTIFICATE FOR THEIR SERVICE AREA BY YEARS
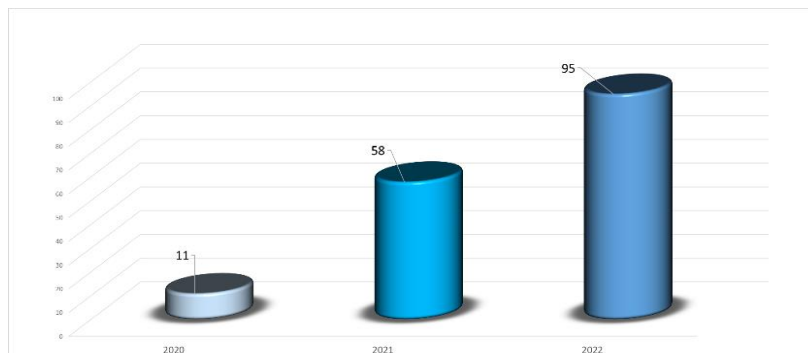
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Environmental Management, 2023

The zero waste project has been adopted by all segments and practices have been initiated. In the period from June 2017, when the implementation started, until the end of 2022, the implementation of zero waste management system was started in 160,000 buildings/compounds across Turkiye, especially in the Presidential Complex, the Grand National Assembly of Turkiye and Provincial Directorates of Environment, Urbanization and Climate Change in 81 provinces.

Graph 96- NUMBER OF BUILDINGS/SETTLEMENTS THAT INSTALLED ZERO WASTE MANAGEMENT SYSTEM BY YEARS
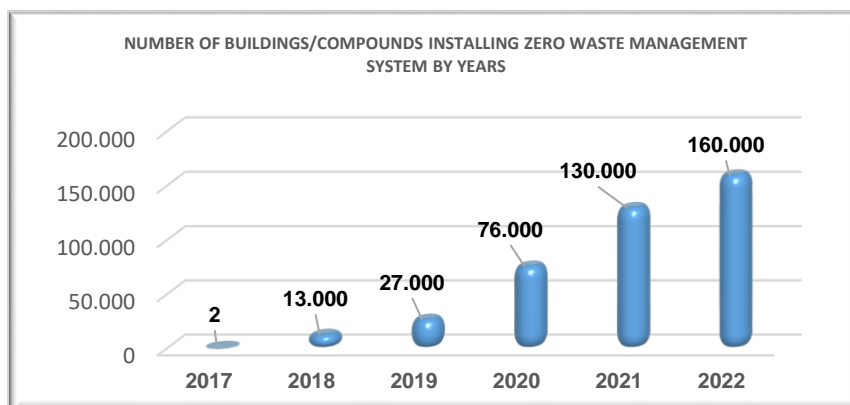
*Calculated cumulatively.
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Environmental Management, 2023

The Zero Waste Information System was established in 2018 in order to enter data, create an inventory, monitor and report on the work carried out, and carry out the zero waste certification process. Users of the Zero Waste Information System are local administrations, public institutions, educational institutions, health institutions, tourism facilities, ports, terminals, airports, fuel stations, chain markets, business centers and industrialists. 148,000,000 people were trained on zero waste by the end of 2022[59].

Graph 97- NUMBER OF PERSON TRAINED BY YEARS

Number Of Zero Waste Trained Persons By Years

7.10- Municipal Waste Recovery Rate

Since the inception of the Zero Waste Project until the end of 2022, a total of approximately 45.5 million tons of recyclable waste, including 25.4 million tons of paper-cardboard, 6.6 million tons of plastic, 2.6 million tons of glass, 0.7 million tons of metal and 10.2 million tons of organic and other recyclable wastes, have been processed by facilities licensed by the Ministry of Environment, Urbanization and Climate Change and brought into the economy.

The collected wastes resulted in an economic gain of 96 billion TL, 703 million kWh of energy savings, 711 million m^3 of water savings, 82 million m^3 of landfill space savings, 4.9 million tons of greenhouse gas emissions prevented, 432 million trees saved, and 108 million barrels of oil saved.

Municipal waste recovery rate increased from 13% in 2017 to 27.2% in 2021 and 30.13% in 2022[60].

Graph 98- MUNICIPAL WASTE RECOVERY RATES BY YEARS

*Calculated cumulatively.

8

LAND

8.1- General Distribution of Land Cover

The indicator is a status indicator and is important in terms of knowing the general land cover distribution clearly, making land use planning in line with monitoring current and potential developments in this area, and evaluating and limiting the pressures of activities such as urbanization and industrialization on natural areas.

Within the scope of CORINE (Coordination of Information on the Environment - Environmental Information Ordert) land cover program, one of the land management projects of the European Union, CORINE 1990, 2000, 2006, 2012 and 2018 project studies were carried out in Turkiye.

According to 2018 CORINE data; 1.94% of Turkiye is composed of artificial areas, 42.26% of agricultural areas, 50.31% of forest and semi-natural areas, 0.51% of wetlands and 4.98% of water bodies.
Between 1990 and 2018, forest and semi-natural areas in Turkiye decreased by 1,550,586 ha, while artificial areas increased by 602,640 ha, agricultural areas by 596,041 ha, water bodies by 1,258,936 ha and wetlands by 157,479 ha. Increasing population, urbanization and industrialization put pressure on agricultural and natural areas.

Looking at the situation in the EU-28 countries, forests and other wooded areas accounted for 41.1% of the total area of the EU-28 in 2018, with 24.2% of the total area covered by cropland and 17.4% by grassland. Shrubs covered 57% of the total area. Artificial areas accounted for 4.2% of the total area of the EU-28, while bare land accounted for 2.4%, water areas for 3.2% and wetlands for 1.7[61].

Graph 99- LAND USE BY YEARS (1990-2018)
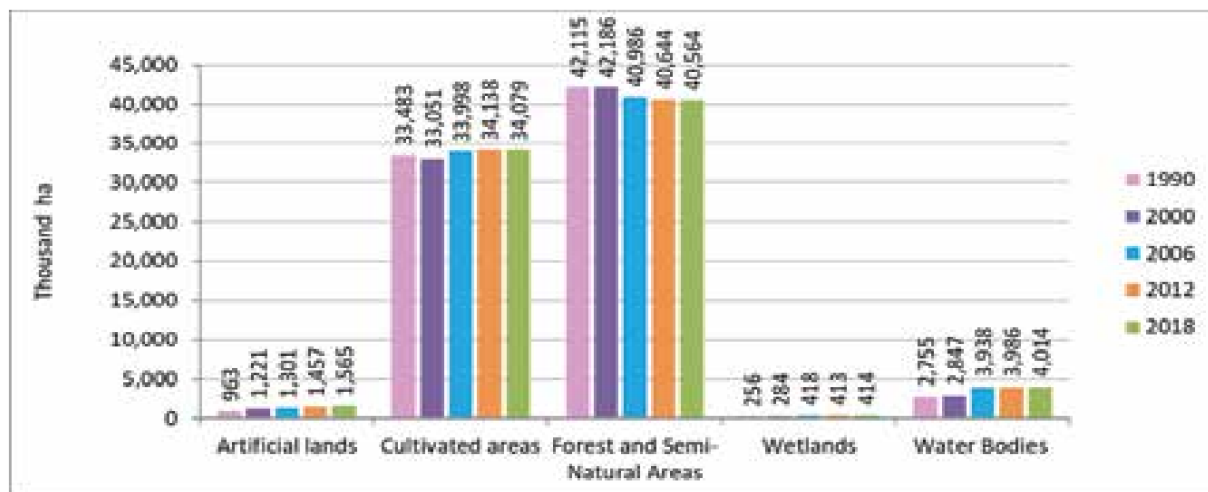
8.2- Misuse of Agricultural Areas

The indicator is a pressure indicator. Increasing population, urbanization and industrialization put pressure on agricultural areas and affect agricultural areas.

In Turkiye, a total of 2,604,517 ha of agricultural land was authorized for non-agricultural use in the 1989-2018 period.

Looking at the class distribution of 722,488 hectares of land permitted for non-agricultural use in the 2005-2018 period; 63.9% is marginal agricultural land and 23.7% is absolute agricultural land.

In 2018, a total of 6,695 non-agricultural use permit applications were made and 21,513 ha of non-agricultural use permit was granted[62].

Law No. 5403 on Soil Conservation and Land Use contains provisions for the protection of irrigated and productive agricultural lands, and that agricultural lands other than marginal agricultural lands should not be opened for construction unless there is a necessity.

Graph 100-MISUSE OF AGRICULTURAL LAND UNDER THE LAW NO. 5403 ON SOIL CONSERVATION AND LAND USE (2001-2018)
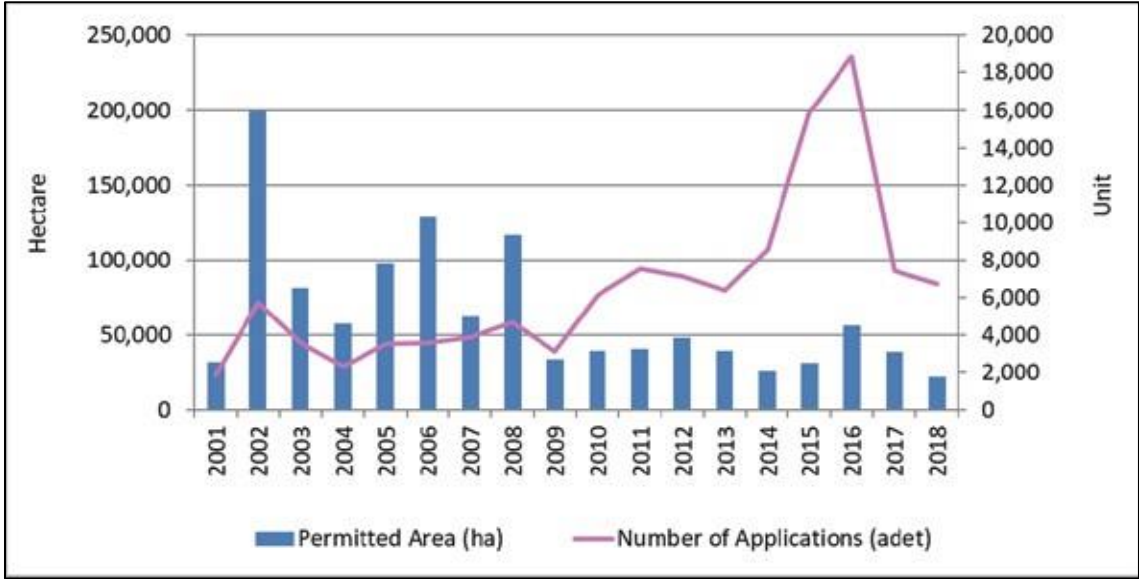
Graph 101-DISTRIBUTION OF LANDS PERMITTEDFOR MISUSE ACCORDING TO THEIR CLASSES 2005-2018
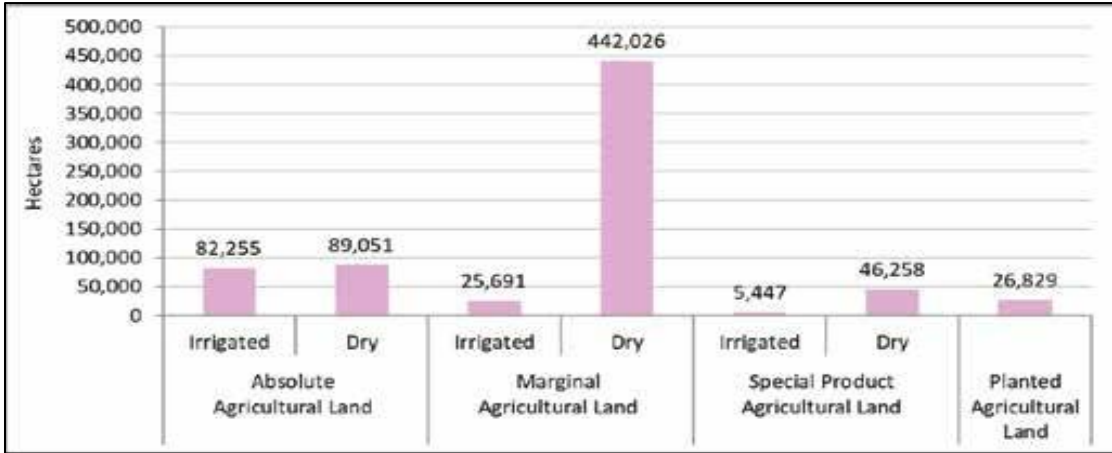
Source: Ministry of Agriculture and Forestry, General Directorate of Agricultural Reform, 2019

8.3- Zones at Risk of Erosion

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The indicator is a status indicator expressing the areas exposed to erosion and their degree.
When Turkiye's characteristics such as geographical location, climate, topography, geological structure and soil characteristics are evaluated, soil erosion occurs intensively and this causes various environmental problems. In order to monitor and evaluate water erosion, Dynamic Erosion Model and Monitoring System (DEMIS) software was developed and annual average soil losses and erosion severity were spatially determined on the basis of main water basin and province.

According to the data obtained as a result of the Dynamic Erosion Model and Monitoring System, a maximum of 642 million tons of soil is displaced by water erosion every year in our country; this value corresponds to an average of 8.24 tons of soil per hectare per year. When water erosion is evaluated in terms of severity classes, it is determined that erosion is very mild in 60.28% of the country's surface area, mild in 19.13%, moderate in 7.93%, severe in 5.97% and very severe in 6.7%.

Graph 102- NATIONAL DISTRIBUTION OF WATER EROSION SEVERITY CLASSES (%) (2023)
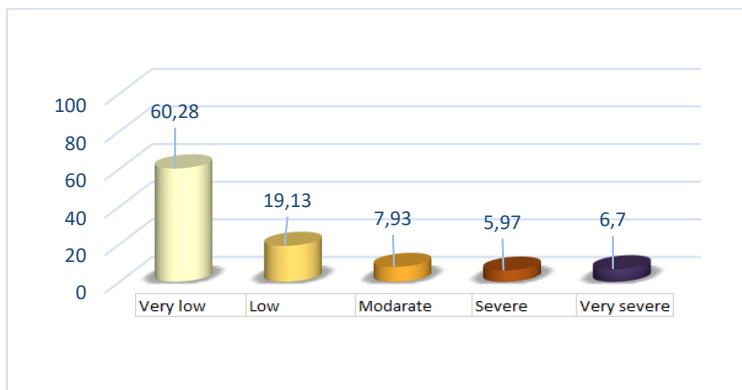
When we evaluate in terms of land use, 38.71% of the displaced land in our country occurs in agricultural areas, 4.17% in forest areas and 53.66% in pasture areas [63].

Graph 103- WATER EROSION DISTRIBUTION BY LAND USE TYPE (%) (2023)
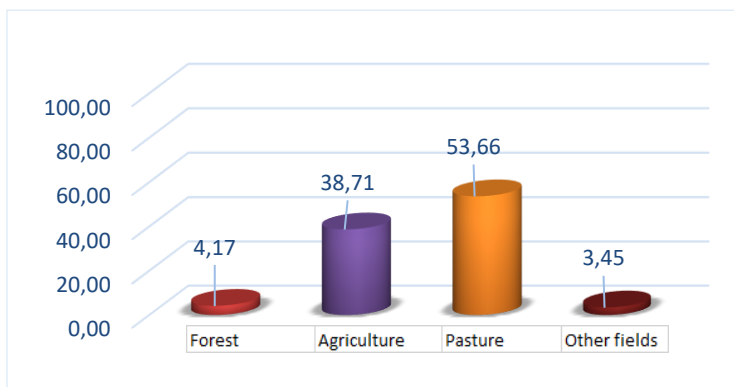
Due to global warming and climate change, the impact area and severity of wind erosion are increasing in regions where drought causes serious land destruction. In this context, comprehensive, dynamic and updatable datasets have been collected to estimate wind erosion on a national scale and the National Dynamic Wind Erosion Model and Monitoring System (UDREMIS) has been created using the Revised Wind Erosion Equation.

The amount of soil transported by wind erosion at the scale of Turkiye and the results of the areas affected by wind erosion are presented. According to spatial analysis at national level, approximately 13 million hectares of land are susceptible to wind erosion.

Graph 104- DISTRIBUTION OF WIND EROSION SEVERITY CLASSES AT NATIONAL SCALE (%) (2023)
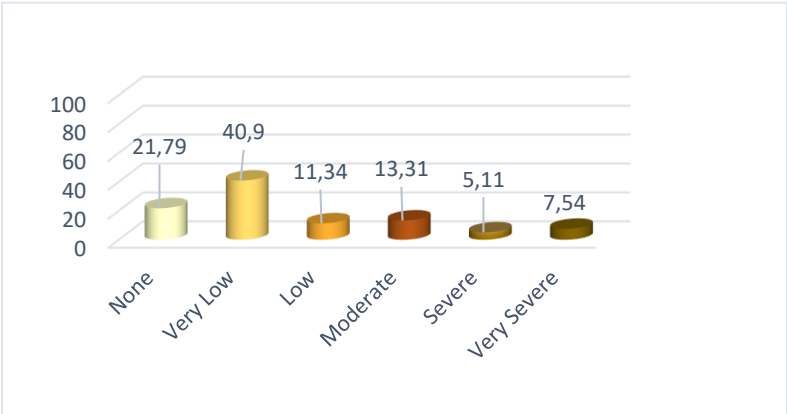
Of the total area with wind erosion potential, 7.54% has very severe wind erosion, 5.11% has severe wind erosion, 13.31% has moderate wind erosion, 11.34% has mild wind erosion and 40.9% has very mild wind erosion. The basins most exposed to very severe wind erosion are the Tigris-Fırat, Kızılırmak and Konya basins, while the basins least exposed to very severe wind erosion are the Çoruh, Eastern Black Sea and Western Black Sea basins, respectively.

Table 17- AREAS AND DEGREES OF WATER AND WIND EROSION

EROSION SEVERITY CLASS		AREA (million ha)
WATER EROSION	Slight	387
	Light	123
	Moderate	51
	Severe	38
	Very Severe	43
WIND EROSION	None	3.56
	Slight	6.78
	Light	1.99
	Moderate	2.36
	Severe	0.95
	Very Severe	1.49

Source: General Directorate of Combating Desertification and Erosion, 2023

Map 7- WATER EROSION MAP OF TURKIYE, 2023
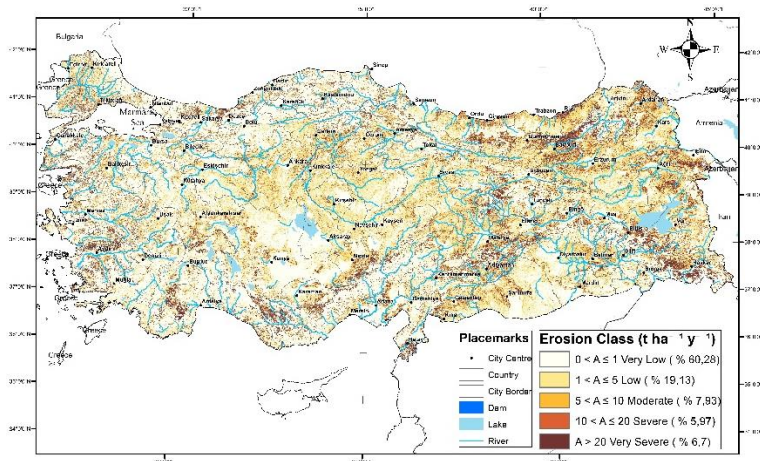
Source: The Ministry of Environment, Urbanization and Climate C General Directorate of Combating Desertification and Erosion 2023

Table 18- TURKIYE DESERTIFICATION MODEL CRITERIA AND INDICATORS

Category (Criteria)	Variable/Parameter/ Index/ Number of Indicators
Climate	10
Water	3
Soil	10
Land Cover and Land Use	2
Topography and Geomorphology	6
Socio-economics	7
Governance	10
Total Criteria	48

Map 8- DESERTIFICATION SENSITIVITY MAP OF TURKIYE
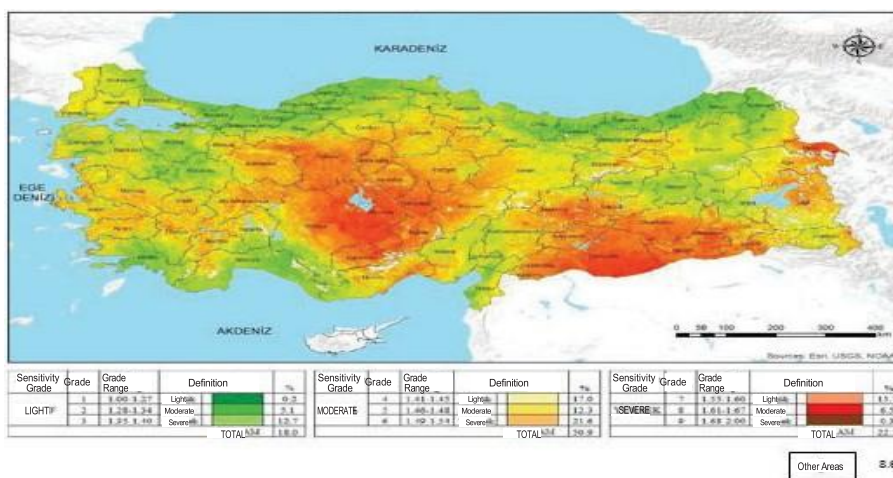
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate for Combating Desertification and Erosion, 2023

When a general assessment is made, according to the Desertification Vulnerability Map, one of the most important studies on desertification / land degradation in Turkiye, 22.5% of Turkiye has high desertification vulnerability. On the other hand, 50.9% is medium and 18% is weakly vulnerable to desertification. 8.6% of Turkiye's land consists of the other areas class (1750 m and above 'Glacier and Permanent Snow', 'Rocky', and 'Sparsely Vegetation Areas').

In the Desertification Sensitivity Map of Turkiye, which was created in line with the national scale desertification criteria and indicators determined in the Turkiye Desertification Model, the % distribution of desertification sensitivity was determined in detail according to the basins. Considering the major hydrological basins of Turkiye, at least 15% of all river basin areas except Aras, Western Black Sea, Konya Closed, Marmara and Meriç-Ergene basins are in the medium-high desertification vulnerability combination group. The basins that are predicted to have High-low level desertification vulnerability in at least 15% of their land are as follows: Akarçay, Burdur, Büyük Menderes, Eastern Mediterranean, Eastern Black Sea, Euphrates-Tigris, Konya Closed, Kızılırmak, Küçük Menderes, Sakarya and Seyhan. Although the percentages are lower, only Akarçay, Burdur, Eastern Mediterranean, Eastern Black Sea, Eastern Black Sea, Euphrates-Tigris, Konya Closed, Kızılırmak, Sakarya and Seyhan basins have been identified as having at least 5% of their land at high-moderate level of desertification sensitivity among all river basins.

Turkiye Desertification Model project aims to expand to Central Asia, Africa and Mediterranean countries with a holistic and interdisciplinary approach[64].

9

BIODIVERSITY

9.1. Total Number of Species, Endangered Species, Rate of Endemism

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An indicator is an indicator of impact. The impact of human activities is closely linked to biodiversity.

The Mediterranean and Near East Centers of plant diversity and centers of origin overlap in Turkiye and it is the homeland for the genetic diversity centers of many cultivated plants.

Considering the climate zone in which it is located, especially in terms of seed plants, our country has a position that can be considered very rich in terms of plant species. The rate of endemism in the flowering plant group (Angiospermae) among seed plants is very high and 3925 of nearly 11,000 flowering plant species at the species and subspecies level are endemic and the rate of endemism is around 34%.

Ferns (Pteridophtyes) are the best known group of seedless plants. The number of species and subspecies of ferns identified from Turkiye is 101, of which only 3 are endemic[65].

Although Turkiye is very rich in endemic plants, some of these species are facing serious threats. According to the IUCN 2001 criteria, about 600 of our endemic species are in the "Very endangered CR" category and about 700 are in the "Endangered EN" category.

Table 19- NUMBER FROM TAXONS INCLUDE TO VARIOUS TYPES FROM SPECIES AND SUBSPECIES, STATE FROM ENDEMISM, RARE AND ENDANGERED SPECIES AND EXTINCT SPECIES

Plant Groups	Identified Species/subspecies	Endemic Species	Rare and Endangered Species	Extinct Species
Algae	2.150	-	unknown	unknown
Lichens	1.000	-	unknown	unknown
Bryophtes	910	2	2	unknown
Sword Ferns	101	3	1	unknown
Gymnosperms	35	5	1	unknown
Monocotyledons	1.765	420	180	-
Dicotyledons	9.100	3.500	1.100	11

Source: National Biodiversity Strategy and Action Plan 2007

Turkiye has a rich and unique situation in terms of fauna in terms of the belt in which it is located. It has been determined that 481 birds, 161 mammals, 141 reptiles and amphibians, 480 marine fish and 236 freshwater fish species live in Turkiye.

Of the 141 reptile and amphibian species distributed in Turkiye, 16 are endemic and 10 of them are under threat. There are no bird species endemic to Turkiye. However, 5 species and 32 subspecies of mammals, 16 species and/or subspecies of reptiles and 70 species/subspecies of freshwater fish are endemic.

Although the invertebrate fauna is not as well known as the vertebrate fauna, it is known that the number of identified species is around 30,000 and the estimated number of species is around 60,000-80,000.

The presence of 10 marine mammal species has been identified in Turkish waters. While there are 21 cetacean species in the Mediterranean basin that regularly or occasionally enter the Mediterranean, only 3 species live in the Black Sea. The Mediterranean monk seal (Monachus monachus) has not been seen in the Black Sea since 1994.

Animal groups	Defined species	Endemic species/subspecies, varieties	Rare and endangered species	Extinct species
VERTEBRATES				
Reptiles/Amphibians	141	16	10	-
Birds	481		17	-
Mammals	161	37	23	4
Freshwater fishes	236	70	-	4
Marine fishes	480	-	-	-
INVERTEBRATES				
Molluscs	522	203	unknown	unknown
Butterflies	6.500	89	89	unknown
Locusts	600	270	-	-
Damselflies	114	-	-	-
Coleoptera	~10.000	~3.000	-	-
Hemiptera	~1.400	~200	-	-
Homoptera	~1.500	~200	-	-

Source: National Biodiversity Strategy and Action Plan 2007

Turkiye is a small continent in terms of biodiversity. The reasons for this include the presence of three different types of bioclimate, three Phytogeographic Regions (FCB), namely Euro-Siberian, Mediterranean and Irano-Turanian, topographical, geological, geomorphological and soil diversity, the presence of different types of wetlands such as seas, lakes, rivers, fresh, salty and soda lakes, elevation differences ranging between 0-5000 meters, having deep canyons and very different ecosystem types, being less affected by glacial periods compared to European countries, the presence of the Anatolian Diagonal connecting northern Anatolia to southern Anatolia and the ecological and floristic differences resulting from this, and being located at the junction of three continents. In summary, Turkiye has agricultural, forest, mountain, steppe, wetland, coastal and marine ecosystems and different forms and combinations of these ecosystems.

Within the scope of the National Biodiversity Inventory and Monitoring Project, province-based biodiversity inventory studies were initiated in 2013 to determine this biological richness, and studies for 81 provinces were completed by the end of 2019. Within the scope of this project, species/population, habitat/ecosystem and regional monitoring indicators were determined for each province and monitoring plans were prepared. With the project, the first parameters of the "National Monitoring Program", which will carry monitoring studies to a national scale for the first time in our country, have been established on a local basis.

As of today, monitoring activities are being carried out in areas of importance in terms of biodiversity and endangered species identified within the scope of the project[66].

Table 21- THE TAXON INFORMATION ON THE SPECIES AND SUBSPECIES BY GROUP

Group of Organisms	Tür ve türaltı takson sayısı
Amphibians	39
Plants	12141
Inland water fish	403
Birds	500
Mammals	175
Reptiles	146

Source: Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks 2021

Table 22- NUMBER OF BIO-SMUGGLING CASES DETECTED BY YEARS (2009-2022)

YEARS	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Number of Detected Bio-SmugglingCases	2	9	21	11	2	5	8	3	3	1	8	1	2	3

Source: Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks, 2023

9.2- Invasive Alien Species

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The indicator is a pressure indicator and invasive foreign species put pressure on native species and their habitats.

While the number of alien species in our seas was 263 in 2005, this number was 354 in 2011 and reached 539 in 2020, 105 of which are invasive. While the majority (72%) of the invasive alien species in the Mediterranean Sea arrive via the Suez Canal, a significant portion (78%) of the invasive alien species in the Black Sea are transported by ships (via ballast water and by attaching to the hulls of ships).

Table 23- ALIEN AND INVASIVE SPECIES IN THE SEA

	Alien Species	Invasive Alien Species
Rhodophyta	21	6
Ochrophyta	15	1
Chlorophyta	10	3
Spermatophyta	1	1
Foraminifera	91	2
Porifera	2	1
Cnidaria	18	4
Ctenophora	2	2
Sipuncula	2	-
Polychaeta	65	20
Arthropoda	79	15
Mollusca	123	16
Bryozoa	7	2
Echinodermata	7	3
Chaetognatha	1	-
Tunicata	14	5
Pisces	80	24
Mammalia	1	-

Source: Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks, 2021

In terrestrial environments and inland waters, 780 alien species were identified in 2021, 156 of which were invasive species[67].

Table 24- ALIEN AND INVASIVE SPECIES FOUND IN TERRESTRIAL ENVIRONMENTS AND INLAND WATERS

	Foreign Species	Invasive Foreign species
Fish	23	11
Herpetofauna	1	1
Bird	9	9
Plant	450	107
Mammalian	4	4
Invertebrate	293	24
TOTAL	780	156*

Source: Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks, 2021

*Çınar, M.E., Bilecenoğlu, M., Yokeş, M.B., Öztürk, B., Taşkın, E., Bakir. K, et al. (2021) Current status (as of end of 2020) of marine alien species in Turkiye, PLoS ONE 16(5): e0251086. https://doi.org/10.1371/journal.pone.0251086

9.3- Protected Areas

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The indicator is a response indicator. Protected areas aim to protect biodiversity and natural resources.

By the end of 2022, the ratio of total protected areas (land and sea) under the responsibility of the Ministry of Agriculture and Forestry and the Ministry of Environment, Urbanization and Climate Change General Directorate for the Protection of Natural Assets to the country's surface area is 13.73%. Protected area calculations do not include pastures, drinking water basins and forest areas (total forest, forest land, pasture, stony land) set aside for nature conservation functions outside protected areas. In 2012, the proportion of protected areas was 7.8%, 7.3% in 2014 and 13.73% in 2022[68]. In 2014, the main reason for the decrease was the amendment made to the "Wetlands Law" in 2014, which introduced a registration process in wetlands.

Graph 105- THE PERCENTAGE OF TERRESTRIAL AND MARINE PROTECTED AREAS IN TOTAL TERRESTRIAL AREA OF IN TURKIYE (%)
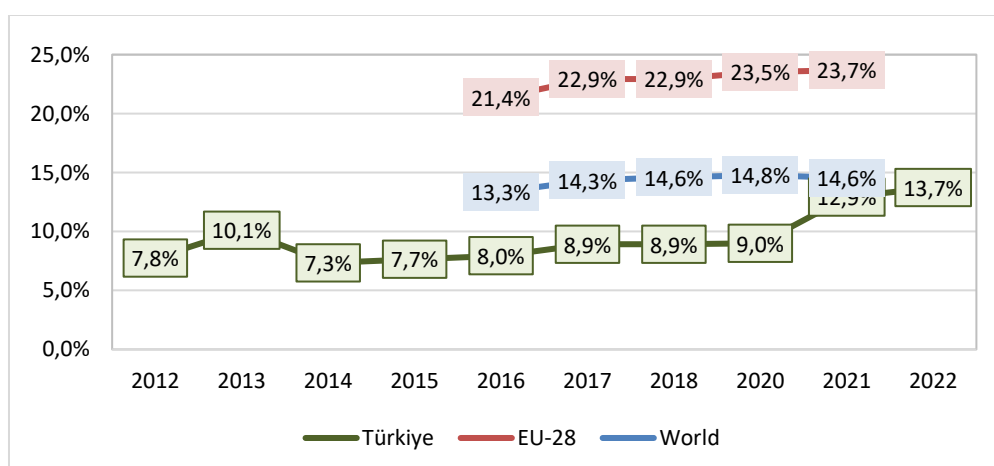
Sources: Ministry of Agriculture and Forestry; General Directorate of Nature Conservation and National Parks, Nature Conservation Status Reports,
For world and EU 28 data: https://data.worldbank.org/indicator/ER.PTD.TOTL.ZS Notes:
(1) With the amendment made to the By-Law on Wetlands in 2014, a registration process was introduced in wetlands.
(2) Protected area size refers to the figure on land and sea.
(3) In total calculations, the percentages are calculated according to the ratio of the areas obtained from the sum of land and marine protected areas to the land and marine area of Turkiye. This ratio is based on 77,997,582 hectares of Turkiye's terrestrial area as a single surface and 46,200,000 hectares of Turkiye's marine area as a single surface for marine protected areas.

Table 25- STATUS AND AREAL DISTRIBUTION OF PROTECTED AREAS IN TURKIYE

YEARS	2013		2022	
Ministry of Agriculture and Forestry Protected Areas	Number (unit)	Area (ha)	Number (unit)	Area (ha)
National Park	40	848.203	48	911.204
Nature Park	192	90.218	261	108.332
Nature Conservation Area	31	64.243	31	46.455
Natural Monument	112	6.684	113	8.357
Wildlife Conservation Area	80	1.191.340	85	1.165.448
Wetlands (of International Importance)	135	3.215.500		
Wetlands of Local Importance (1)			32	92.236
Ramsar Areas (1)			14	184.487
Wetlands of National Importance (1)			59	869.697
Protectrion Forests	55	320.451	55	247.648
Honey Forest	200	24.861		
City (Urban) Forest	128	11.722	134	9.728
Gene Conservation Forests (in-situ)	257	47.978	339	43.232
Seed Stands (in-situ)	351	47.063	311	40.338
Seed Stands (ex-situ)	179	1.414	213	1.552
TOTAL OVERLAPPING	1.760	5.373.162	1.695	3.434.290
Ministry of Urbanization and Climate Change Protected Areas	Number (quantity)	Area (ha)	Number (quantity)	Area (ha)
Special Environmental Protection (SEPA) Areas	16	2.459.116	19	3.834.213
Natural Site	1.273	1.322.749	3.834	2.749.626
GENERAL TOTAL OVERLAPPING	3.049	7.883.511	5.548	8.812.317
Ratio of protected areas in the Country's total surface area (%) (3)		%10,1		%13,73

Sources: Ministry of Agriculture and Forestry; General Directorate of Nature Conservation and National Parks, Nature Conservation Status Reports 2022
https://www.tarimorman.gov.tr/DKMP/Belgeler/Tabiat%20Koruma%20Durum%20Raporu/TKDR_TR_2022.pdf

Notes:

(1) With the amendment made to the By-Law on Wetlands in 2014, a registration process was introduced in wetlands.

(2) The size of protected areas refers to the number of terrestrial and marine areas.

(3) In total calculations, percentages are calculated according to the ratio of the areas obtained from the sum of land and marine protected areas to the land and marine area of Turkiye. This ratio is based on 77,997,582 hectares of Turkiye's terrestrial area as a single surface and 46,200,000 hectares of Turkiye's marine area as a single surface for marine protected areas.

9.4- Protected Coastal Length

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The indicator is a response indicator. Coastal areas are more affected by human pressure and climate change. The aim is to reduce these impacts and protect biodiversity. Turkiye's total coastal length is 8592 km, excluding islands. The protected coastal length is 3216 km by 2022, which corresponds to 37%[69].

Table 26- TURKIYE'S PROTECTED COASTAL LENGTH

YEARS	2002	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Turkiye's Protected Coastal Length (km)	1775	1853	1855,3	1855,3	1860	1865	1957	1957	2083	2110	3216	3216
Ratio of Protected Coastal Length to Total Coastal Length (%)	20	22	22	22	22	22	23	23	24	24	37	37

Source: "Nature Conservation Status Reports 2021" and Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks, 2023

9.5- Wildlife Conservation Activities

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The indicator is a response indicator to protect biodiversity. The General Directorate of Nature Conservation and National Parks of the Ministry of Agriculture and Forestry has taken 481 bird, 150 mammal and 130 reptile species under protection. In 2019, 20 Species Action Plans were completed and action plans have been made for 100 species so far.

In order to protect endangered wild animals in our country, 85 Wildlife Development Areas have been declared by the Decree of the Council of Ministers. Every year, a regular inventory of the species in these areas is carried out. In these areas, species such as the Chamois, Anatolian Wild Sheep, Wild Goat, Gazelle, Red Deer, Fallow Deer, Roe Deer, Roe Deer, Mountain Rooster, Bald Ibis, Hyena, Black Vulture, Brown Bear, Wolf, Otter and water birds are protected. In order to breed endangered wild animal species, breeding stations are established and adult animals are released back into the wild in suitable habitats.

Activities are carried out within the scope of the CITES Convention to prevent illegal trade of endangered wild animals[70].

The State Railways General Directorate's Ecological Bridge Application on Railways is an application for wildlife crossings, combating habitat fragmentation and protecting habitats, and provides connections between habitats. It helps to reduce accidents caused by vehicles hitting animals.

An ecological bridge with a crossing area of approximately 2,500 meters was built for the protection of wild animals on the Ankara - Eskişehir High Speed Train line. The bridge, which is the first in the world among high-speed train lines with its new technology and span, will also make a significant contribution to the population of wild animals living in the region.

The Habitat Bridge at km 416+170 between Beylikova and Sazak was completed and put into service in 2021.
On the high-speed train line between Halkalı and Kapıkule, 3 ecological bridges are under construction.

Table 27- WILDLIFE CONSERVATION ACTIVITIES

YEARS	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Number of Mammalian Wild Animals Reproduced and Placed in Nature	62	84	148	114	36	21	27	0	181	120	117
Winged Wild Animal Placements (Partridge - Pheasant)	64.895	79.200	91.050	97.200	103.100	92.000	97.500	95.000	107.000	105.000	95.000
Number of Trout Stocked in In-Forest Waters	2.042.000	3.172.000	1.291.000	1.510.000	3.016.000	4.274.000	3.900.000	3.700.000	4.450.000	4.450.000	3.700.000
Total Number of Wildlife Production Facilities(Partridge, Pheasant, Mammal, Bald Ibis, Trout, Mountain Gazelle)	20	21	21	23	24	24	24	24	24	24	24
Number of Wild Animals Rehabilitated and Released to Nature	921	1.643	2.109	2.561	2.465	4.881	5.733	5.889		8146	11.377

Source: "Nature Conservation Status Reports 2021" and Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks, 2023

9.6- Regulation And Supervision Of Wild Animal Trade In Accordance With International Conventions

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The indicator is a response indicator for biodiversity conservation.

CITES Convention (The Convention on International Trade In Endangered Species of Wild Fauna and Flora); "Convention on International Trade in Endangered Species of Wild Fauna and Flora".

Turkey became a party to the CITES Convention in 1996 and the CITES National Implementation Regulation was published in 2001 and revised by being published in the Official Gazette dated 20.07.2019 and numbered 30837.

The Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks is authorized to issue CITES Certificates and take necessary actions for birds, mammals except marine mammals, reptiles, arthropods and species that are outside the duties of the Management Authorities specified in subparagraphs (a), (b) and (c). It also carries out tasks such as coordination, reporting and training. Our country is in Category A due to its successful work.

CITES Permit Certificates are issued for international trade of species included in the CITES Appendix lists. In 2022, a total of 2791 documents were issued. For species not included in the CITES Appendix lists, Certificates of Conformity for Import and Export are issued. In 2022, a total of 1562 documents were issued[71].

Graph 106- NUMBER OF CITES CONSENTS CERTIFICATES BY DOCUMENT TYPE (1998-2022)
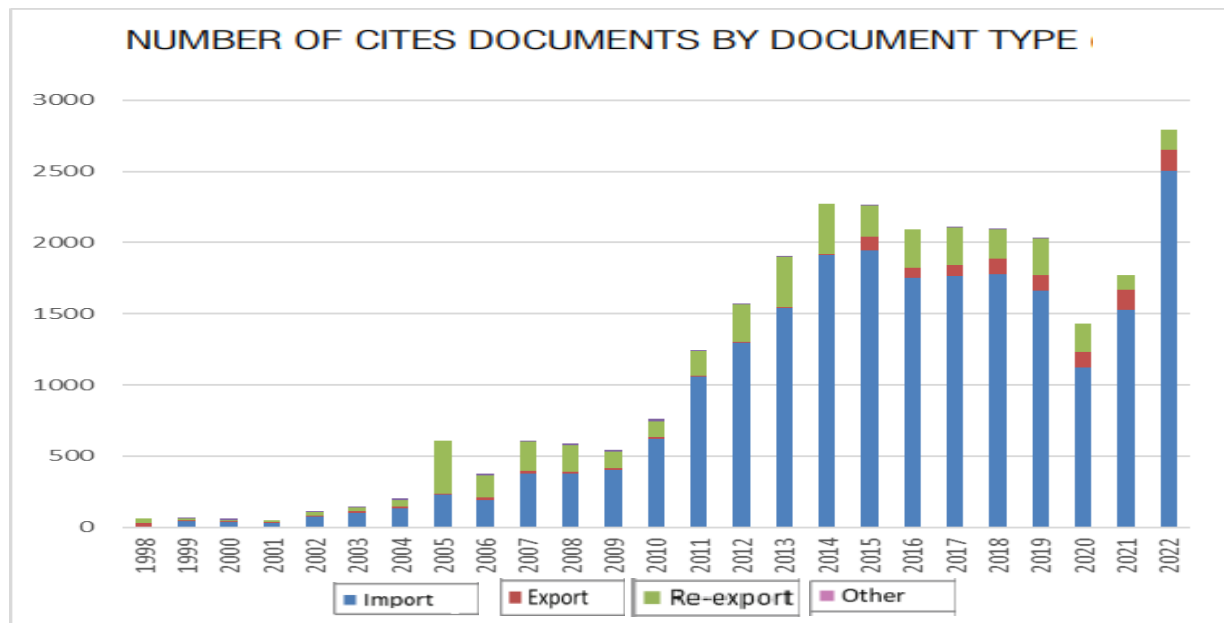
Source: Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks, 2023

9.7- Distribution of Forest Areas

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The indicator is a status indicator and refers to the total size of forest areas. As of 2022, Turkiye's total forest area is 23,245,000 ha. This forest area is 29.8% of the total area of the country. However, 59% of this area is normally closed and 41% is closed with gaps[72].

As of 2022, the tree wealth of Turkiye's forests is 1,736,402,000 m^3 . Of this, 96% belongs to normal closed forest areas and 4% to closed forest areas with gaps. Between 1973 and 2022, the tree wealth of the country's forests increased by 800 million m^3[73].

While the amount of forest area in Turkiye was 26.7% of the country's surface area in 1999, this rate increased to 29.8% in 2022.

Table 28- FOREST AREA BY YEARS

YEARS	1973	1999	2005	2010	2012	2015	2018	2019	2020	2021	2022
Forest Area (hectare)	20.199.296	20.763.248	21.188.747	21.537.091	21.678.134	22.342.935	22.621.935	22.740.297	22.933.000	23.110.000	23.245.000

Source: Ministry of Agriculture and Forestry, General Directorate of Forestry, https://www.ogm.gov.tr/ekutuphane/Sayfalar/Istatis- tikler.aspx

Graph 107- DISTRIBUTION OF FOREST AREAS BY FOREST FORM

	1973	1999	2005	2009	2010	2012	2015	2018	2019	2020	2021	2022
Degraded closed	11.343	10.736	10.568	10.417	10.334	10.119	9.639	9.639	9.656	9.669	9.610	9.537
Normal	8.856	10.028	10.621	10.973	11.203	11.559	12.704	12.983	13.083	13.264	13.500	13.708
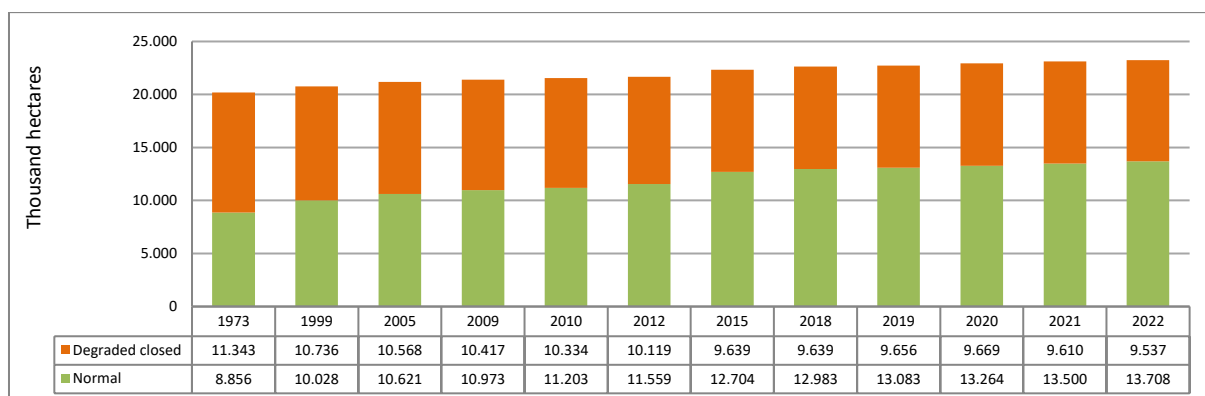
Source: Ministry of Agriculture and Forestry, General Directorate of Forestry, 2023

Graph 108- DISTRIBUTION OF GROWING STOCK BY FOREST FORM

	1973	1999	2005	2009	2010	2012	2015	2018	2019	2020	2021	2022
Degraded closed	88.479	87.179	89.091	83.791	81.051	71.088	71.951	69.873	69.514	68.759	68.454	68.163
Normal	847.033	1.113.612	1.199.034	1.290.450	1.347.454	1.400.050	1.539.824	1.588.247	1.609.843	1.628.295	1.653.241	1.668.239
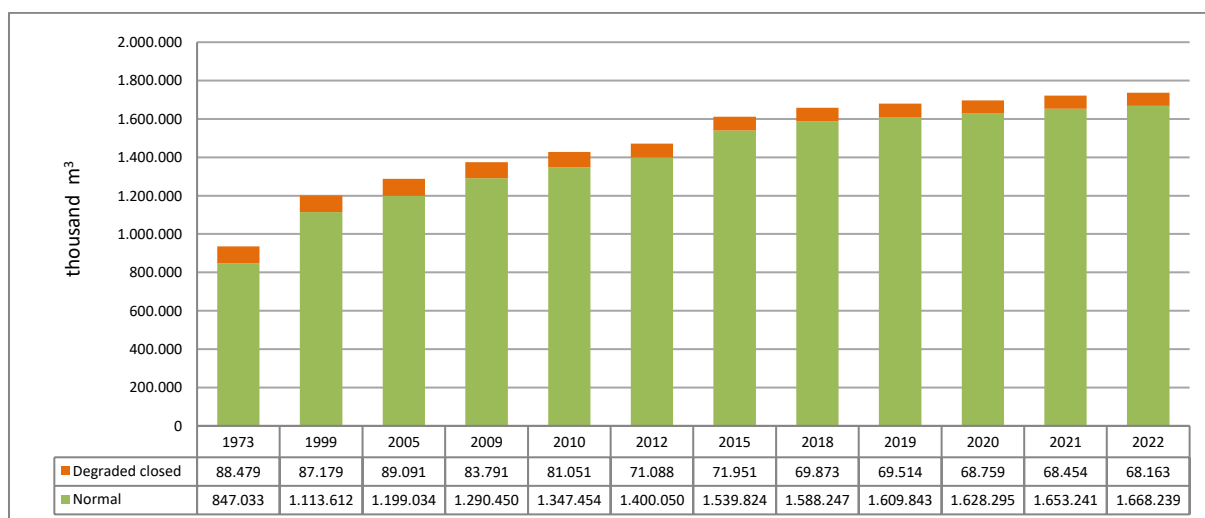
Source: Ministry of Agriculture and Forestry, General Directorate of Forestry, 2023

41% of Turkiye's forests are closed forest areas with gaps and are unproductive. Within the scope of rehabilitation works in 2022, forest establishment works were carried out on a total area of 168,608 ha, including afforestation on 30,183 ha, rehabilitation on 55,107 ha, erosion control on 19,850 ha, flood control on 16,238 ha, pasture improvement on 12,893 ha, special afforestation on 6,537 ha, artificial tensil on 27,800 ha[74].

Graph 109-(1990-2022) FOREST ESTABLISHMENT ACTIVITIES (ha)
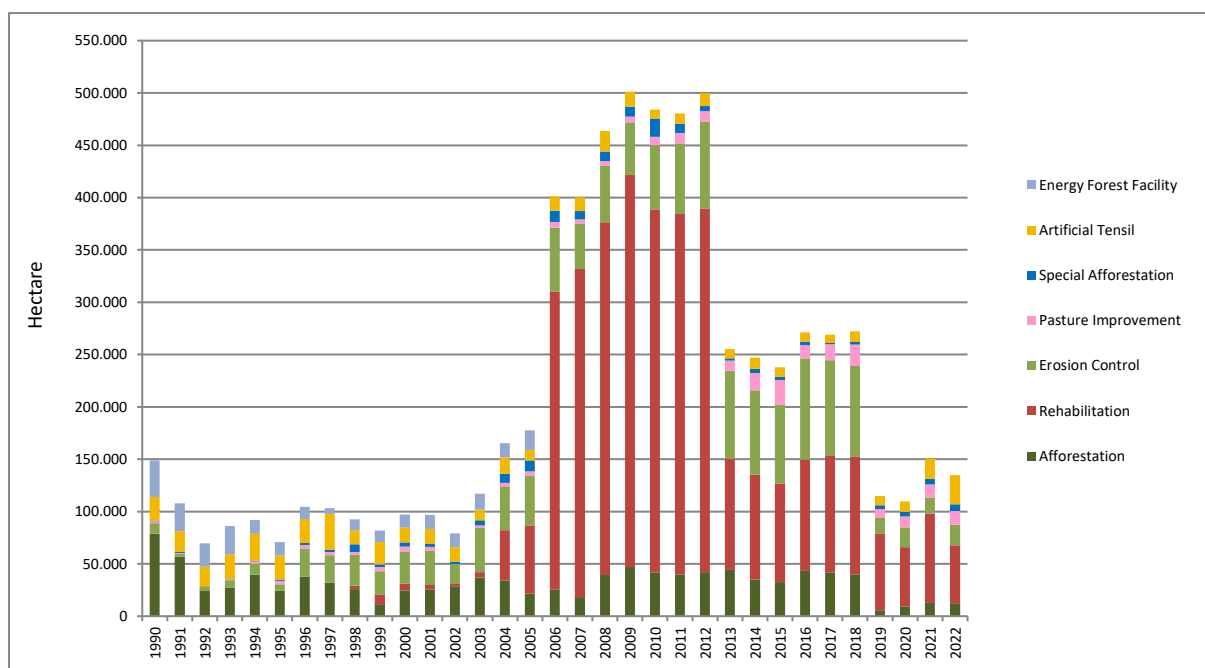
Source: Ministry of Agriculture and Forestry, General Directorate of Forestry, "Forest Statistics 2022", https://www.ogm.gov.tr/tr/e-kutuphane/resmi-istatistikler, 2023

Table 29- GROWING STOCK PER HECTARE 2022

	Forest Area (ha)	Forest Wealth (m³)	Growing Stock (m³/ha)
Normal	13.707.843	1.668.239.148	122
Degraded closed	9.537.157	68.162.852	7
TOTAL	**23.245.000**	**1.736.402.000**	**75**

Table 30- PRODUCTION GROWTH RATE 2022

Increase (m³)	Production (m³)	Ratio of Production to Increase (%)
47.800.000	30.077.533	63

Our normal closed forests are managed as same-aged or different-aged. Forests in the "d" and "e" age group of our normal closed forests operated as same-aged and forests in the "A" establishment type of our forests operated as different-aged are considered as old forests. According to these criteria, approximately 1.246.096 ha of our normally closed forests consist of old forests. Accordingly, 9% of normal closed forests consist of old forests.

9.8- Distribution of Forest Areas According To Tree Species

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Diversity of tree species is a positive indicator of biodiversity status. As of 2022, 29.4% of our total forest area is oak, 22.85% is Turkish pine, 17.54% is Crimaen pine[75].

Table 31- DISTRIBUTION OF FOREST AREAS ACCORDING TO MAIN TREE SPECIES

Tree type groups	Forest Form (ha)			
	Productive	Degraded	Total	%Ratio
Oak	2.773.648	4.059.616	6.833.264	29,40
Turkish pine	3.578.387	1.732.467	5.310.854	22,85
Crimaen pine	2.817.266	1.260.350	4.077.616	17,54
Beech	1.634.341	269.895	1.904.236	8,19
Juniper	945.660	509.170	1.454.830	6,26
Scotch pine	445.095	1.106.885	1.551.980	6,68
Fir	306.673	204.491	511.164	2,20
Cedar	395.304	110.111	505.415	2,17
Spruce	273.988	75.546	349.534	1,50
Stone pine	152.920	21.676	174.596	0,75
Alder	99.430	25.321	124.751	0,54
Chestnut	64.200	12.752	76.952	0,33
Hornbeam	44.503	10.430	54.933	0,24
Maritime Pine	50.093	5.327	55.420	0,24
Poplar	24.559	24.073	48.632	0,21
Hazelnut	12.236	700	12.936	0,06
Daphne	5.719	6.562	12.281	0,05
Ash tree	10.117	1.957	12.074	0,05
Other species	73.704	99.828	173.532	0,75
TOTAL	13.707.843	9.537.157	23.245.000	100,00

(*) Name with other species, cypress, Aleppo pine, radiata pine, false acacia, sycamore, walnut, sweetgum

Source: Ministry of Agriculture and Forestry, General Directorate of Forestry, "Forest Statistics 2022", https://www.ogm.gov.tr/ekutuphane/Sayfalar/Istatistikler.aspx,2023

9.9- Distribution of Forests by Their Main Functions

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Today, forests are planned based on ecosystem-based functional planning approach and multidimensional utilization. According to this plan, 40% of forests have economic, 51% ecological and 9% sociocultural functions[76].

Table 32- DISTRIBUTION OF FORESTS BY THEIR MAIN FUNCTIONS

MAIN FUNCTIONS	GENERAL FOREST AREA (hectare)			
	Normal Closed	Degraded closed	TOTAL	% Ratio
1- Economic Function	7.309.737	2.089.726	9.399.463	40
2- Ecological Function	5.225.153	6.551.792	11.776.945	51
3- Sociocultural Function	1.172.953	895.639	2.068.592	9
TOTAL	13.707.843	9.537.157	23.245.000	100

Source: Ministry of Agriculture and Forestry, General Directorate of Forestry, "Forest Statistics 2022".

9.10- Deadwood

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This indicator shows the volume of standing and dead trees in forests and other wooded areas by forest type. In the national forest inventory, countries usually classify by type (standing, snag, lie, species and state of decay). Deadwood (large woody debris) in the form of deadwood (dead trees) and tree stumps (dead woody trees) is a habitat for a wide range of organisms and an important component of forest soil after humification

Law 299 and FAO's FRA report guidelines take deadwood as 1% of the above-ground biomass figure. Above-ground biomass for 2021 is reported as 1054 million m³, of which 1% of deadwood corresponds to 10.54 million m³. For 2022, above-ground biomass is 1063 million m³, of which 1% of dead wood amounts to 10.63 million m³. The annual change is the difference between the two, which is 0.09 million m³[77].

Table 33- ABOVE GROUND BOIMASS AND DEADWOOD AMOUNT

YEARS	2021	2022
Above Ground Biomass	1054	1063
Deadwood	10.54	10.63

Source: Ministry of Agriculture and Forestry, General Directorate of Forestry, 2023

10

INFRASTRUCTURE AND TRANSPORT
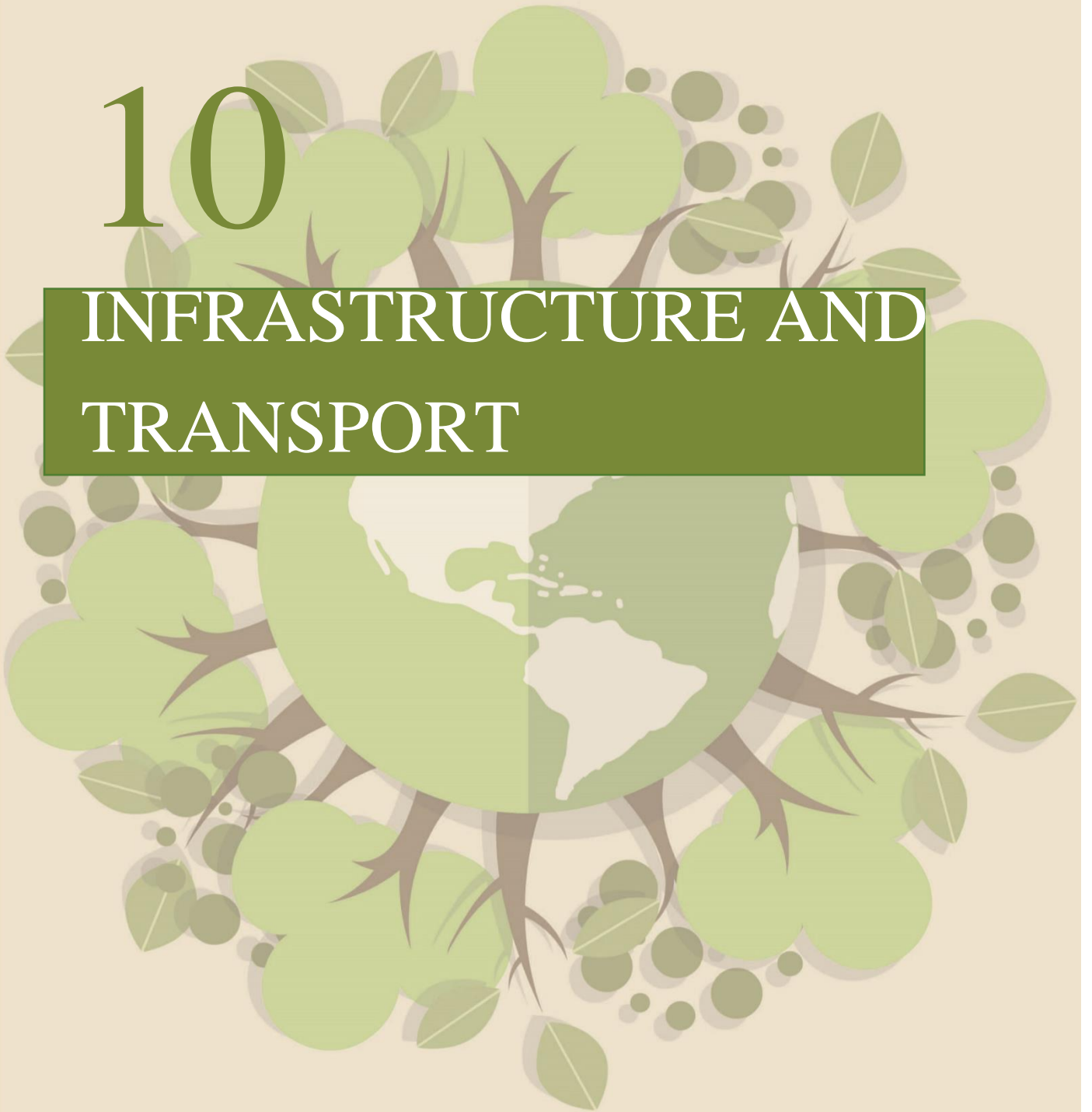
10.1- Highway -Railway Network Intensity

Road network density provides information on the fragmentation of wildlife habitats and natural landscapes due to active transportation. Environmental risks such as pollution and noise from traffic are another important factor. In this respect, the indicator is a pressure indicator.

The number of active airports open to civil air traffic in 2022 is 57 and the total length of airline flight paths is 75,902 km. Turkiye has a total of 403 coastal facilities, with 182 ports operating internationally. By the end of 2022, the length of the road network (provincial roads, state roads and highways) is 68,541 km and the length of the railway network (conventional and high-speed lines) is 13,128 km[78].

Table 34- HIGHWAY AND RAILWAY NETWORK BY YEARS (km)

YEARS	2002	2005	2010	2015	2016	2017	2018	2019	2020	2021	2022
Highway Network Length (km)	63.082	63.606	64.865	66.437	67.161	67.620	68.034	68.231	68.633	68.541	68.640
Railway Network Length (km)	10.948	10.973	11.940	12.532	12.532	12.608	12.740	12.803	12.803	13.022	13.128

Source:

1) State and Provincial Roads Length by Years (km)General Directorate of Highways, 2023

2) Completed Motorways by Years General Directorate of Highways, 2023

3) Directorate General of TCDD, 2023 2015-2019 Statistical Yearbook

Compared to highways, railways emit less greenhouse gases into the atmosphere due to more efficient consumption of energy. They also play an important role in protecting the natural environment as less land is used in railway construction. On the other hand, railways also contribute to the reduction of respiratory disorders and other diseases caused by air pollution.

In Turkiye, the length of highway and railway main line per 100,000 population is 88 km and 12 km, respectively. In EU-27 countries, these figures are 400 km and 42 km, respectively. In terms of surface area, the road length per 1000 km^2 in Turkiye is 81 km and the railway main line length is 13 km. In EU-27 countries, these figures are 461 km and 49 km, respectively[79,80,81].

10.2- Passengers and Freight Transported by Mode Of Transport

The indicator is a driving force indicator and plays a role in the environmental impacts of transportation. In domestic passenger transportation, the share of air transport increased from 1.8% in 2000 to 6.8% in 2022, while the share of road transport decreased from 95.9% to 91.2% and the share of rail transport from 2.2% to 1.5% in the same period. In 2022, the share of maritime transport in passenger transportation is 0.48[82].

In 2022, the share of road transportation in domestic freight transportation is 89.3%. In 2022, there is a decrease in the shares of railway and maritime transportation in domestic freight transportation compared to 2000.

Graph 110- DOMESTIC PASSENGER TRANSPORT RATES (% rate based on passenger-km)*

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Domestic Aviation	1,8%	1,6%	1,6%	1,6%	1,8%	2,1%							7,0%	7,9%	8,5%	9,1%	9,4%	9,6%	9,4%	8,3%	5,5%	6,3%	6,8%
Maritime	0,03%	0,03%	0,02%	0,02%	0,63%	0,65%	0,72%	0,73%	0,74%	0,75%	0,68%	0,63%	0,52%	0,56%	0,59%	0,56%	0,33%	0,59%	0,56%	0,60%	0,39%	0,38%	0,48%
Railway	2,2%	2,4%	2,3%	2,7%	2,1%	1,9%	2,0%	1,9%	1,7%	1,6%	1,6%	1,6%	1,1%	1,0%	1,1%	1,1%	1,0%	1,0%	1,2%	1,3%	0,5%	0,6%	1,5%
Road	95,9%	95,9%	96,1%	95,7%	95,5%	95,3%	97,3%	97,4%	97,5%	97,6%	97,8%	97,8%	91,5%	90,5%	89,8%	89,2%	89,3%	88,8%	88,8%	89,9%	93,6%	92,7%	91,2%

Graph 111- DOMESTIC FREIGHT TRANSPORT RATES (% rate based on ton-km)**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Domestic Aviation	0,2%	0,2%	0,2%	0,2%	0,2%	0,2%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Maritime	7,8%	8,6%	6,3%	5,8%	4,2%	3,5%	3,6%	4,8%	5,5%	5,8%	5,9%	6,9%	6,6%	6,9%	5,9%	6,3%	6,1%	6,4%	6,0%	5,9%	6,7%	6,0%	6,1%
Railway	5,3%	4,3%	4,3%	5,1%	5,4%	5,0%	5,0%	4,9%	5,3%	5,2%	5,3%	5,1%	4,8%	4,4%	4,6%	3,9%	4,1%	4,3%	4,8%	4,6%	4,5%	4,2%	4,6%
Road	86,7%	86,9%	89,3%	88,9%	90,2%	91,3%	91,4%	90,3%	89,3%	89,0%	88,8%	88,0%	88,6%	88,7%	89,5%	89,8%	89,7%	89,2%	89,5%	91,9%	88,7%	89,8%	89,3%

Sources: Ministry of Transport and Infrastructure, 2023.
Notes:
1) Passenger transportation does not include urban transportation.
2) Freight and passenger transportation on the road network under the responsibility of General Directorate of Highways is taken into account.
3) Marmaray and suburban transportation are excluded in railway passenger transportation data. In passenger km, only Turkish State Railways (TCDD A.Ş.) Mainline data were taken.
4) Domestic cargo and domestic passenger transportation between airports of General Directorate of State Airports Authority is taken into consideration. There is no data for the fields left blank.
5) It refers to the passenger-km value of passengers and ton-km value of cargo transported in Cabotage.

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Road passenger-km (million)	164.304	174.312	182.137	187.593	209.001	206.098	212.464	226.913	242.265	258.874	268.178	276.073	290.734	300.852	314.734	329.363	339.601	288.992	336.188	348.489
Railway passenger-km (million)	4.583	3.835	3.661	3.878	4.080	3.650	3.572	3.606	4.002	3.006	3.020	3.458	3.708	3.323	3.683	4.374	4.912	1.478	2.251	5.922
Maritime passenger-km (million)	1.020	1.150	1.240	1.395	1.561	1.570	1.643	1.575	1.571	1.459	1.667	1.806	1.838	2.060	2.109	2.101	2.257	1.204	1.391	1.831
Airline passenger-km (million)	2.790	3.236	4.016	5.213	5.924	6.417	6.819	15.159	17.974	19.731	23.357	26.204	29.790	31.730	34.018	34.996	31.174	16.948	23.017	25.982
Road ton-km (million)	152.166	156.853	166.824	177.399	181.106	181.935	176.455	190.365	203.072	216.125	224.048	234.497	244.329	253.140	262.739	266.502	267.579	272.913	311.818	323.512
Railway ton-km (million)	8.669	9.417	9.152	9.676	9.921	10.739	10.326	11.462	11.677	11.670	11.177	11.992	10.474	11.661	12.794	14.478	14.707	15.428	14.433	16.551
Maritime ton-km (million)	6.462	7.420	6.480	7.084	9.573	11.114	11.397	12.059	15.411	15.753	17.332	15.572	17.223	17.279	18.946	17.801	17.612	20.742	20.973	22.119
Airline tonne-km (million)								18	20	20	24	26	25	19	18	13	15	12	24	26

Sources: Ministry of Transport and Infrastructure, Directorate General of TCDD

Notes: 1) Passenger transportation does not include urban transportation. 2) Freight and passenger transportation on the road network under the responsibility of the General Directorate of Highways is taken into consideration. 3) Freight and freight transportation belonging to the Directorate General of TCDD is taken into consideration. Suburban line passenger transportation is excluded. 4) Domestic cargo and domestic passenger transportation between airports of General Directorate of State Airports Authority is taken into consideration. There is no data for the fields left blank. 5) Cargo and passenger transportation on the cabotage line of the General Directorate of Maritime Affairs has been taken into consideration. The value given as Ton-Mile has been converted to Ton-Km and the value given as Passenger-Mile has been converted to Passenger-Km.

The use of railways should be preferred to roads in terms of their environmental impact. In addition to developing the railway network, it is also important to use it efficiently. Although the capacity utilization rate for freight transportation on railways increased to 75% in 2013, it dropped to 51% in 2021.

Graph 113- CAPACITY USAGE RATES OF FREIGHT TRANSPORT ON RAILWAYS (%)
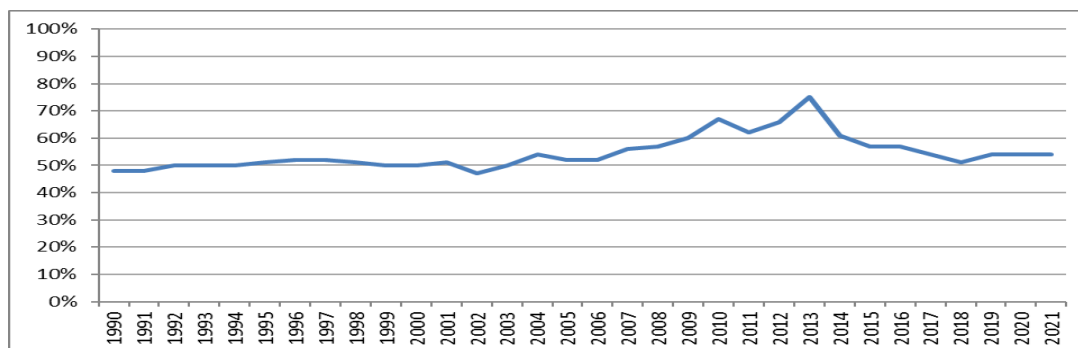
Source: Ministry of Transport and Infrastructure, for 1990-2016 data: Directorate General of TCDD, Republic of Turkiye State Railways Transportation Inc,.2022
NOTE: As of 2017, freight transportation data is only for the transportation within the scope of TCDD Transportation Inc. General Directorate. Data of other railway train operators are not included.

10.3- Greenhouse Gas Emissions By Mode Of Transport

The indicator is a pressure indicator and the contribution of transportation to climate change and the distribution of this contribution by type is important for monitoring and controlling emissions.

According to TURKSTAT's greenhouse gas emission inventory data, in 2021, Turkiye's total greenhouse gas emissions are 564.4 million tons of CO_2 equivalent. In 2020, 80,680 kilotons of CO_2 equivalent of total greenhouse gas emissions were from transportation, while in 2021, this amount accounts for 91,200 kilotons of CO_2 equivalent of total emissions. In 1990, the share of transportation-related emissions in total greenhouse gas emissions was 12.8%, while this figure was 16.2% in 2021.

According to TURKSTAT's greenhouse gas emission inventory data for 2021; 94.8% of CO_2 emissions from transportation are from road, 3.1% from domestic aviation, 1.2% from domestic navigation, 0.4% from railway and 0.4% from other modes of transportation.

Graph 114- GREENHOUSE GAS EMISSIONS BY MODE OF TRANSPORTATION
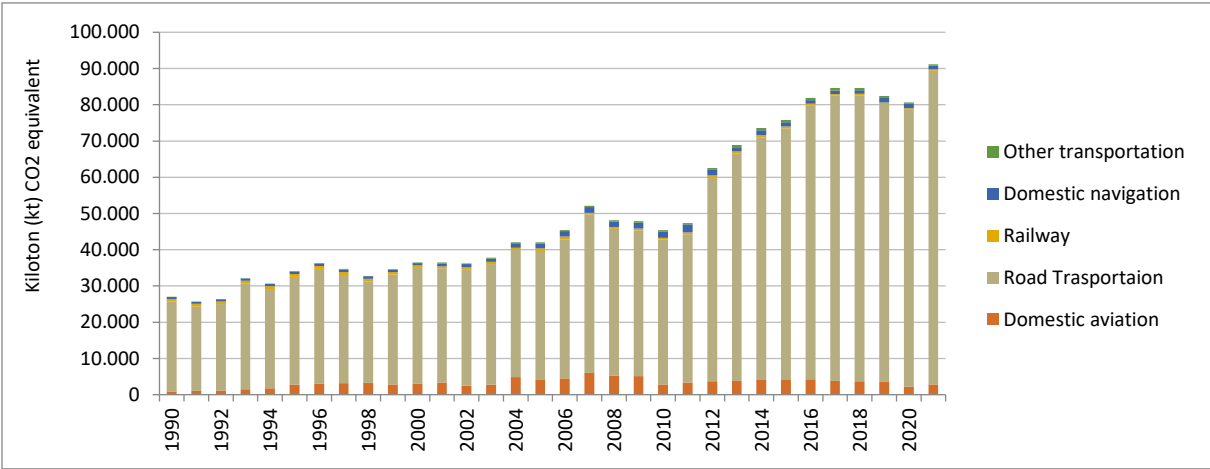
Table 35- GREENHOUSE GAS EMISSION BY MODE OF TRANSPORT (kiloton CO_2 equivalent)

Years	1990	1995	2000	2005	2010	2015	2018	2019	2020	2021
Total	26.969	34.113	36.465	42.041	45.392	75.79	84.617	82.428	80.680	91.200
Domestic Aviation	923	2.775	3.099	4.089	2.862	4.205	3.688	3.509	2.164	2.856
Road Trasportaion	24.777	29.760	31.850	35.532	39.941	69.309	78.907	76.720	76.601	86.499
Railway	721	768	713	757	517	480	435	400	323	356
Domestic Navigation	509	726	623	1.299	1.682	1.147	931	1.217	1.264	1.128
Other transportation	39	83	180	364	390	656	657	581	328	361

Source: TURKSTAT, 2023

10.4- Emissions of Air Pollutant from Transport

Emissions of air pollutants from transportation are an important pressure indicator representing the impacts of transportation activities on air pollution.

The work under the United Nations Economic Commission for Europe (UN-ECE) "Convention on Long-Range Transboundary Air Pollution (CLRTAP)" and the related Protocol "Long Term Financing of the *co-operative programme for monitoring and evaluation of the long-range transmission of air pollutants in Europe* (EMEP)" is carried out by the Ministry of Environment, Urbanization and Climate Change.

A national air pollutant emission inventory is prepared annually and reported through the the European Environment Information and Observation Network (EIONET) together with the UNECE Secretariat. The first reporting was realized in 2011 and improvements are implemented annually. Emission calculations are made using emission factors taken from internationally recognized guidance documents.

An important sector included in the National Air Pollutant Emission Inventory is transportation. Emissions calculated with the COPERT software recommended in the EMEP/EEA - EMEP/EEA Reporting Guidelines are included in the 200-2021 time period. Emissions from transportation are calculated separately for road, maritime, airway and railway sectors, and data based on road transportation are taken into consideration as the scope of the indicator[83].

Graph 115- EMISSION OF SO$_2$, NOX , NH$_3$, NMVOC, PM$_{10}$ AND CO FROM ROAD TRANSPORT
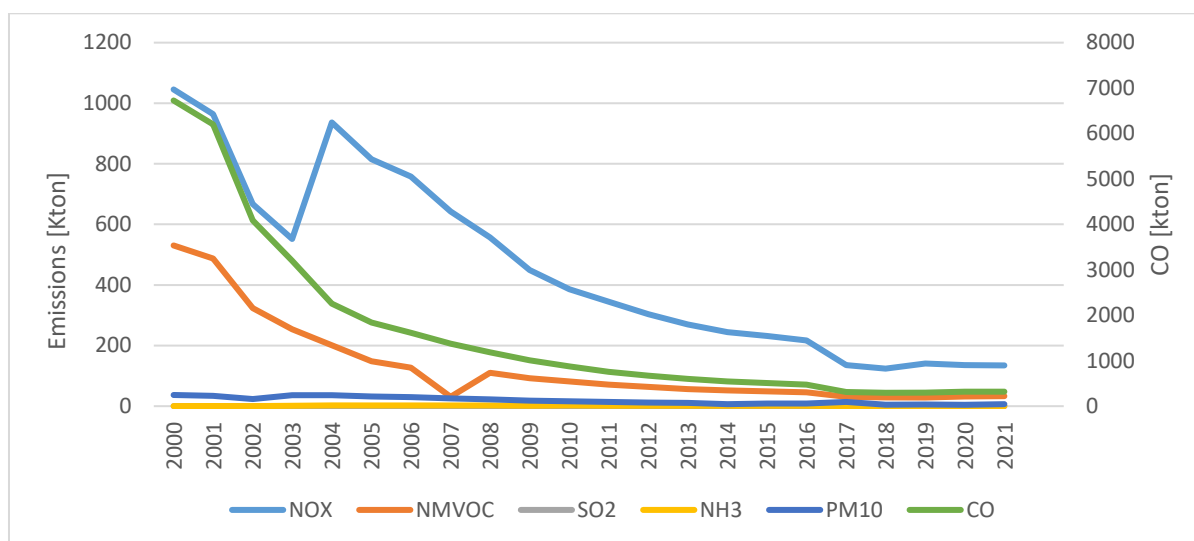
The graph shows the totals of road-based emissions related to the nationally calculated emission inventory. When the general trend of emissions is analyzed, the decrease in vehicle emissions is noteworthy with the renewed engine technologies and adjustments made in fuel content.

10.5- Final Energy Consumption by Mode Of Transport

D B D E T

Energy consumption is an important driver of environmental stressors, most notably climate change. Reducing the number of trips and time spent in traffic, using more fuel-efficient modes of transportation, improving the energy efficiency of vehicles, and using technologies that use renewable or low-carbon fuels are some of the methods used to reduce transportation-related fuel consumption.

In 2021, the total amount of energy consumed in the transportation sector increased by 250% compared to 1990, reaching 30,562 thousand TOE (Tons of Oil Equivalent). Excluding 216 thousand TOE used for pipelines, 95% of the 30,346 thousand TOE energy is used for roads and 3.14% for airlines, 1.2% used in maritime transport and 0.7% in railways [84].

In 2021, the energy used in road transportation increased by 259% compared to 1990. This was followed by airways with 206% increase and maritime transportation with 132% increase compared to 1990. The amount of energy spent on rail transportation decreased by 9% compared to 1990.

Graph 116- FINAL ENERGY CONSUMPTION BY MODE OF TRANSPORT (Thousand TOE)

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
■ Pipelines					113	156	176	173	218	265	256	250	326	300	284	393	293	283	170	216
■ Road	8015	9651	10508	11785	12604	14368	13392	13296	14416	16151	17249	18657	19588	22833	24866	26164	26286	25605	25472	28809
■ Domestic Aviation	311	924	1034	1368	1509	2014	1748	1721	956	1127	1258	1253	1367	1405	1430	1272	1247	1174	722	954
■ Maritime	158	226	195	411	464	507	491	525	541	718	528	370	432	189	48	393	398	396	412	368
■ Railways	238	276	270	285	289	217	174	171	184	194	194	204	227	209	185	207	216	229	194	217

Source: Ministry of Energy and Natural Resources, General Directorate of Energy Affairs, 2023

Of the 30,346 thousand TOE of energy consumed in the transportation sector excluding pipelines in Turkiye in 2021, 98.7% is petroleum products, 0.2% is natural gas, 0.8% is bioenergy and wastes.

10.6- Share of Alternative Fuel Vehicles

Ⓓ Ⓑ Ⓓ Ⓔ Ⓣ

When the distribution of registered cars by fuel type is analyzed, 36.9% of the 14,269,352 cars registered as of the end of 2022 were diesel, 35.1% were LPG, 26.8% were gasoline, and 1.0% were electric or hybrid. The share of cars with unknown fuel type is 0.2%.[85].

As of 2021, the majority of cars in EU countries have a gasoline engine. In 2021, the only country with a higher share of diesel cars was Greece (75.8%). In 2021, the highest share of gasoline cars among new registrations was recorded in Cyprus (85.5%), Malta (80.5%), Lithuania (77.6%), the Netherlands (77.4%) and Finland (77.3%)[86].

Distribution of registered cars by fuel type (%)	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
■ Unknown(1) (%)	5,4	4,1	3,2	2,6	1,5	1,2	0,9	0,8	0,6	0,5	0,4	0,4	0,4	0,3	0,3	0,3	0,3	0,3	0,2
■ Electrical - Hybrit (2) (%)								0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,3	0,7	1,0
■ LPG (%)	14,7	21,8	24,8	28,2	32,6	35,6	38,4	40,2	41,3	41,5	41,4	40,3	39,2	38,4	37,9	37,3	36,7	35,9	35,1
■ Diesel (%)	4,7	6,8	9,5	11,8	13,9	15,7	18,3	21,6	24,3	26,9	29,2	31,6	33,6	35,4	36,8	38,1	38,3	37,6	36,9
■ Gasoline (%)	75,2	67,3	62,5	57,4	52,0	47,6	42,3	37,4	33,9	31,1	29,0	27,6	26,8	25,9	24,9	24,2	24,4	25,5	26,8

Source: TURKSTAT, (1) Unknown fuel type includes vehicles for which the fuel type was left blank or incorrect data was entered by mistake in the registration process.

(2) Includes electric, gasoline-electric and diesel-electric automobiles.

According to TURKSTAT data, while gasoline, diesel and LPG fueled vehicles were used between 2004 and 2007, the use of electric, gasoline-electric, diesel-electric and diesel-electric vehicle fuel types has become widespread since 2015.

The distribution of fuel used according to types of vehicles registered in traffic (cars, minibuses, buses, vans, trucks, trucks, motorcycles, tractors and special purpose vehicles) is given in the graph. 5,847 electric-hybrids (electric, gasoline-electric, diesel-electric) in 2015, reaching 264,329 in 2022.

Graph 118- DISTRIBUTION OF CARS REGISTERED TO THE TRAFFIC ACCORDING TO FUEL TYPE

	2015	2016	2017	2018	2019	2020	2021	2022
■ GASOLINE	5.977.352	6.142.806	6.321.658	6.390.297	6.427.550	6.782.575	7.296.270	7.969.926
■ DIESEL	9.576.896	10.337.907	11.102.943	11.592.878	11.865.482	12.311.225	12.704.380	13.070.762
■ LPG-CNG-LNG	4.358.751	4.527.674	4.705.599	4.785.035	4.749.808	4.904.546	5.028.359	5.115.423
■ ELECTRIC-HYBRID	5.847	9.536	18.261	30.167	49.744	82.710	157.153	264.329
■ UNKNOWN	75.626	72.501	70.484	67.544	64.391	63.801	62.957	62.407

10.7- Number Of Road Motor Vehicles

Emissions from motor vehicles are one of the major causes of air pollution, especially in large urban centers. The number of vehicles is a pressure indicator.

The total number of motorized land vehicles, which was 1,566,405 in 1979, increased and reached 26,482,847 in 2022. When 1979 and 2022 are compared in terms of the shares of motorized land vehicle types, the increase in the shares of automobiles, vans and motorcycles in 2022 is noteworthy. In 2022, 53.9% of the total number of motor vehicles were automobiles, 16.2% were vans, 15.6% were motorcycles, 7.9% were tractors, 3.5% were trucks, 1.8% were minibuses, 0.8% were buses and 0.3% were special purpose vehicle[87].

Despite the increasing number of vehicles, the vehicle ownership rate in Turkiye is far below the European average due to high prices and taxes. According to 2021 data, the number of cars per thousand inhabitants is 687 in Poland, 681 in Luxembourg, 675 in Italy and 157 in Turkiye[88]. 2021 EU-27 average is stated as 567[89].

Graph 119- NUMBER OF ROAD MOTOR VEHICLES BY YEARS (1979-2022)
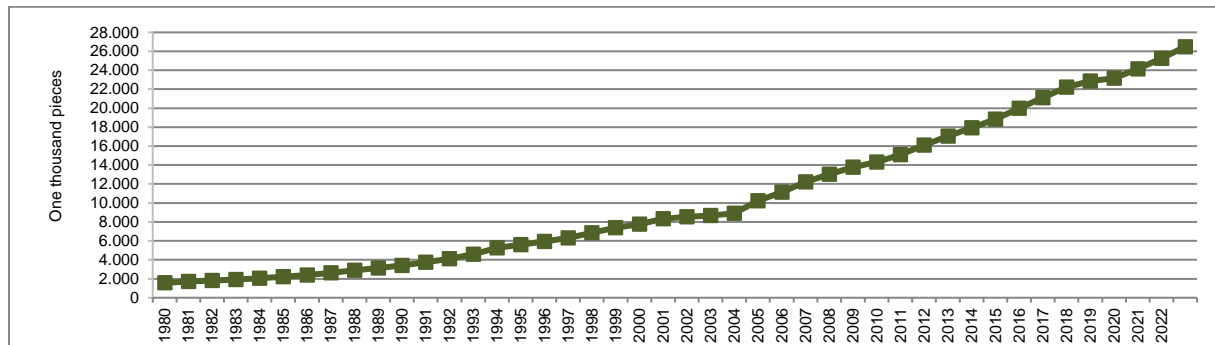
Graph 120-DISTRIBUTION OF ROAD MOTOR VEHICLES TYPES IN 1979 AND 2022 (%)
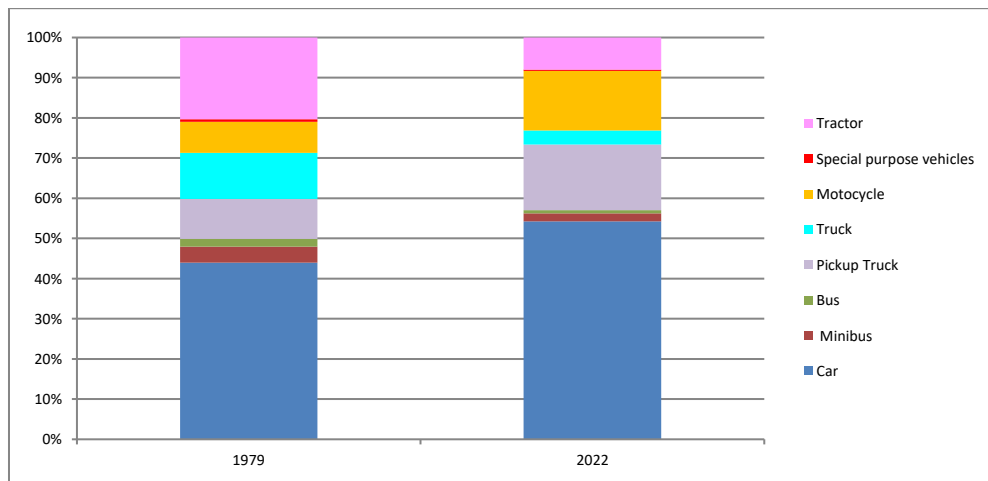
Source: TURKSTAT, 2023. Note: Vehicles published under construction equipment and heavy tonnage vehicles included in special purpose vehicles have been shown under the heading "Truck" since 2004.

10.8- Average Age of Vehicles Registered to the Traffic

D B D E T

The indicator is a driving force indicator. The average age of the vehicle fleet is an indirect indicator of the environmental performance of road transport. Replacing old, polluting vehicles with newer and cleaner ones is expected to reduce the value of this indicator and the impact on the environment.

However, despite this expectation, the average age of registered vehicles increased from 12 years in 2004 to 14.8 years in 2022. While the average age of automobiles was 10 years in 2004, it increased by 40% to 14.0 years in 2022. As of 2022, the average age of other vehicle types is 15.5 for minibuses, 15.4 for buses, 13.3 for vans, 17.8 for trucks, 13.3 for motorcycles, 14.3 for special purpose vehicles and 24.4 for tractors[90].

In EU-27 countries, the average age of passenger cars in 2021 was 12.7 years, lower than in Turkiye. In 2021, the average age of other vehicle types was 1212 years for light commercial vehicles, 14.2 years for heavy vehicles and 12.7 years for buses[91].

Graph 121 -AVERAGE AGE OF VEHICLE TYPES REGISTERED TO THE TRAFFIC (2004-2022)
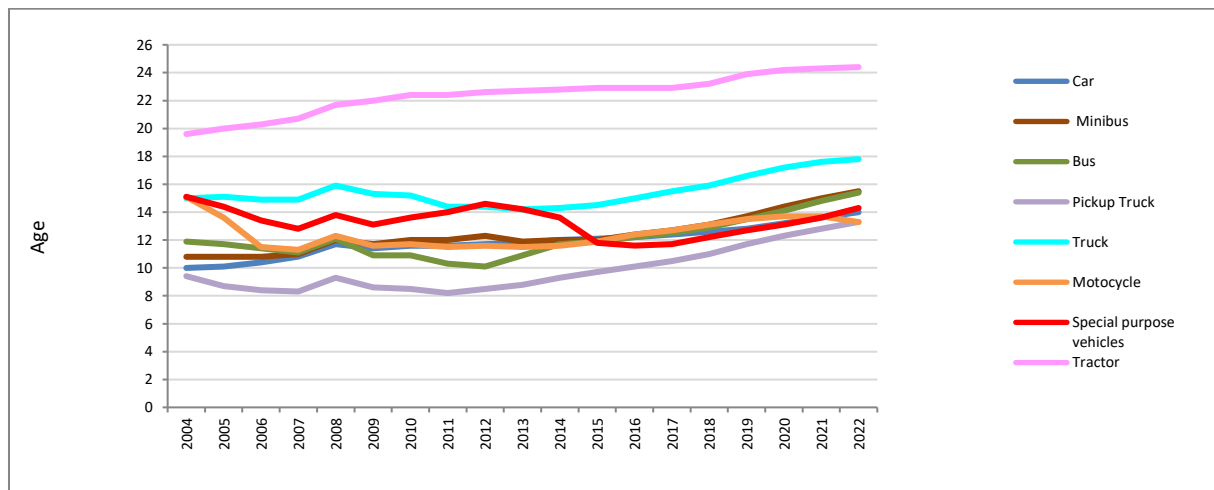
Source: TURKSTAT, 2023

The share of cars over 21 years old is high in Turkiye, at 26.8% in 2022[92]. As of 2022, the share of passenger cars 21 years and older is 41.3% in Poland, 33.2% in Estonia and 29.3% in Finland[93].

As of 2022, 21.9% of registered vehicles in Turkiye are between 0-5 years old, 23.4% are between 6-10 years old, 15.6% are between 11-15 years old, 12.3% are between 16-20 years old and 26.8% are over 21 years old.

Graph 122- DISTRIBUTION OF TOTAL VEHICLES REGISTERED TO THE TRAFFIC BY AGE GROUP (%), 2004-2022
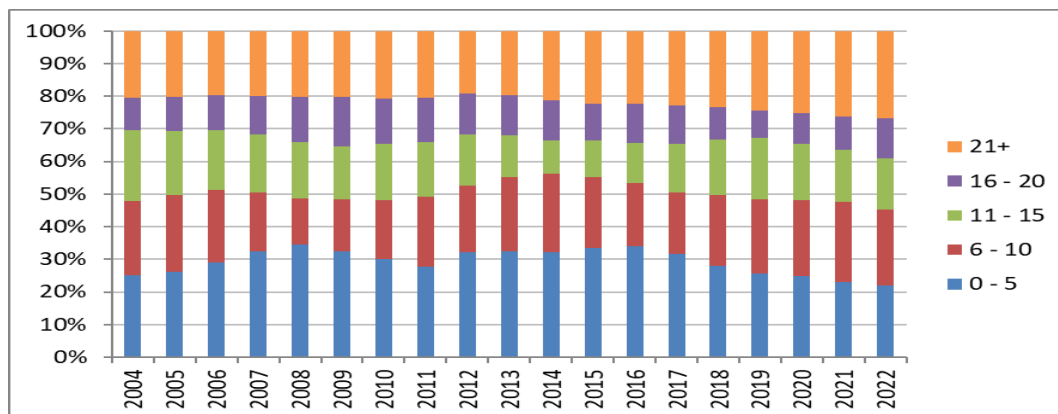
Source: TURKSTAT, 2023

10.9- Actual Change in Transportation Prices by Type

D B D E T

The indicator is a driving force indicator. Prices of transport services influence the growth of the transport sector and the choice of mode of transport. It is important to monitor prices to see whether users are given appropriate incentives to use more environmentally friendly modes of transport. However, there are changes over time that can affect the reliability of the comparison. For example, people do not buy the same cars or use the same transport service package (price/quality) as ten years ago[94].

According to the 2003 indexed consumer price index (CPI), until the end of 2022, the cost of passenger transportation by road increased by 980.8%, by rail by 881.9%, by sea and inland waterway by 577%, and by air by 663%[95].

Graph 123- ACTUAL CHANGE IN TRANSPORT PRICES BY TYPE
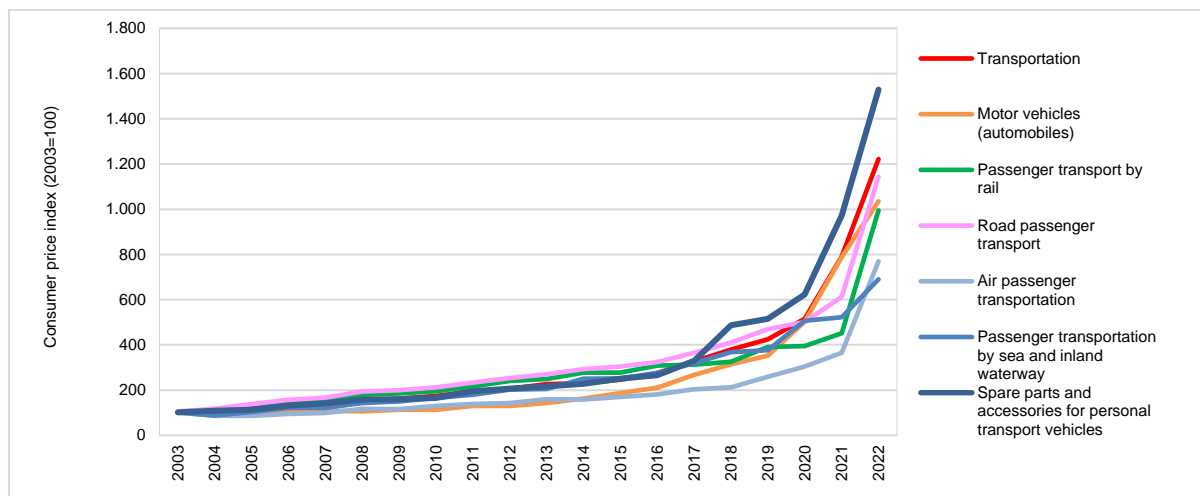
Source: TURKSTAT, 2023 Notes:

   (1)   2003=100 base year Consumer Price Index (CPI) index

10.10- Taxes/Expenditures and Subsidies in Transport

D B D E T

The indicator is a driver indicator. It is important in terms of encouraging the use of railways, which are more environmentally advantageous than highways. According to the data of the Ministry of Transportation and Infrastructure, the change in payments under public service obligation in the railway sector by years is given below.

Graph 124- PAYMENTS UNDER PUBLIC SERVICE OBLIGATION IN THE RAILWAY SECTOR (2017-2020)
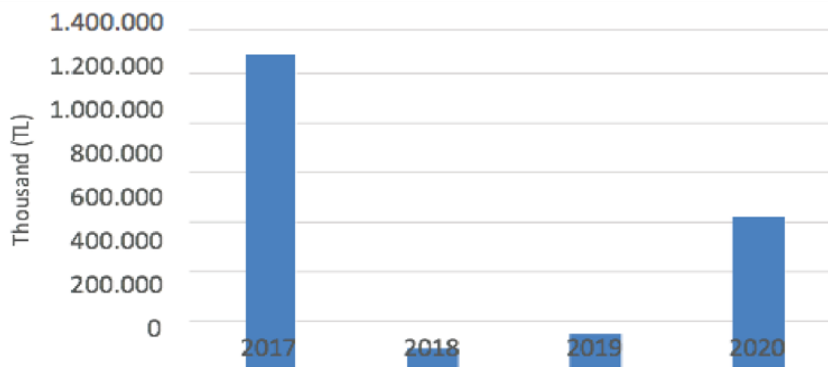
Source: Ministry of Transportation and Infrastructure, 2021

The incentive applied in terms of maritime transportation is the Special Consumption Tax (SCT) not collected from the fuel (diesel and fuel oil) used by the ships operating commercially in Cabotage. In this context, the amount of Special Consumption Tax (SCT) fuel not collected from the fuel (diesel and fuel oil) used by the ships operating commercially in cabotage registered in our Registries in 2022 is 360296,462 metric tons and the amount is 830299742,88 TL.

10.11- Distance traveled by registered road motor vehicles

I **P** D E T

In Türkiye, registered passenger cars, minibuses, buses, small trucks, trucks and motorcycles to the traffic travelled 329 billion 591 million kilometres in year 2021. Passenger cars constituted 54.3% of total vehicle-km followed by small trucks with 21.4%, trucks 12.5%, motorcycles 4.4%, minibuses 4.1% and buses 3.3% share.

In Türkiye, in year 2021 while total number of road motor vehicles (passenger cars, minibuses, buses, small trucks, trucks and motorcycles are covered) increased by 4.7%, total vehicle-km increased by 9.6% compared with the previous year. Number of motorcycles increased by 6.6% followed by passenger cars 4.6%, small trucks 4.5% and trucks 3.1%, while it decreased by 1.7% for minibuses and by 1.7% buses. However, vehicle-km increased by 22.6% for buses, 21.6% for minibuses, 11.4% for motorcycles, 11.4% for small trucks, 9.4% for passenger cars and 1.5% for trucks respectively.

Graph 125- DISTANCE TRAVELED BY REGISTERED ROAD MOTOR VEHICLES
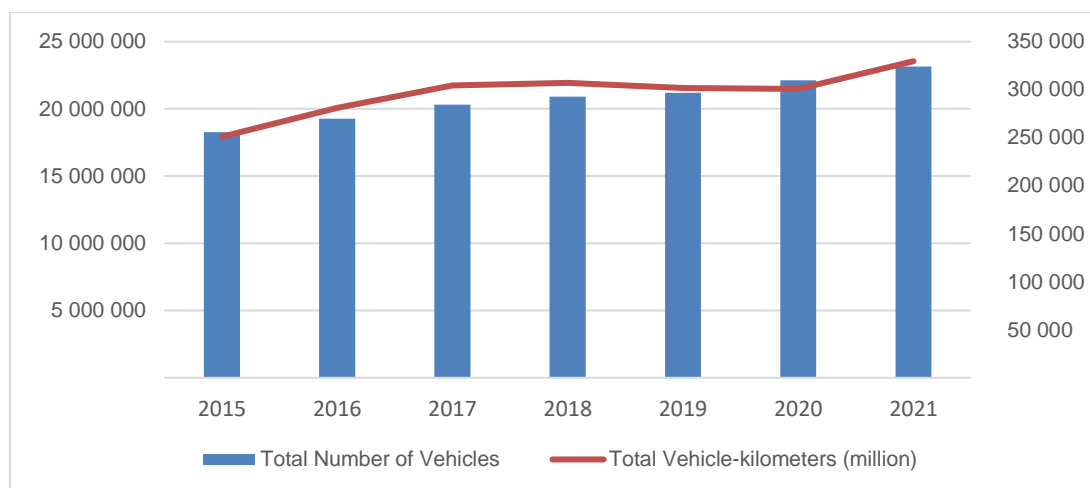
Source: TURKSTAT, 2023

11
ENERGY

11.1- Total Energy Consumption by Sector

Ⓓ Ⓑ Ⓓ Ⓔ Ⓣ

The indicator is a driving force indicator describing energy consumption levels. Total energy consumption in Turkiye in 2021 was 159.43 Mtoe (million tons of oil equivalent). Turkiye's total energy consumption increased by 204% compared to 1990, by 80% compared to 2005 and by 8% compared to 2020[96].

Looking at the distribution of total energy consumption in Turkiye in 2021, it is seen that the highest consumption is realized in the industrial sector with 26.1% and in the housing and services sector with 23.9%. This is followed by cycle and electricity with 22.3%, transportation with 19.2%, non-energy with 4.8% and agriculture and livestock with 3.2%[97].

Graph 126- TOTAL ENERGY CONSUMPTION BY SECTOR (Mtoe)

Source: Ministry of Energy and Natural Resources, https://enerji.gov.tr/enerji-isleri-genel-mudurlugu-denge-tablolari,2023
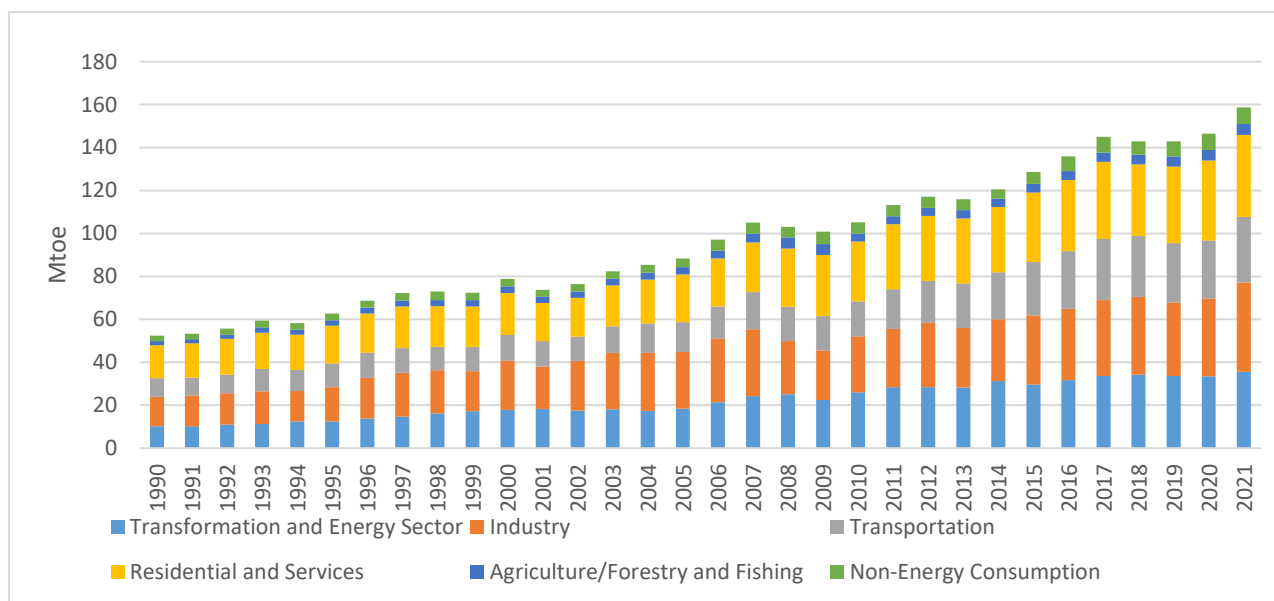
Table 36- TOTAL ENERGY CONSUMPTION BY SECTOR (Thousand TOE)

Years	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Supply of Energy Products	52.465	62.968	79.428	88.672	105.888	129.139	136.229	145.305	143.666	144,21	147,17	159.432
Cycle and Energy Sector	10.228	12.442	17.834	18.347	26.048	29.672	31.655	33.522	34.517	33,56	35,47	35.573
Industry	13.641	15.986	22.876	26.410	26.077	32.157	33.254	35.329	36.277	34,30	36,26	41.614
Transportation	8.723	11.077	12.007	13.849	16.314	24.936	26.812	28.425	28.452	27,69	26,97	30.562
Housing and Services	15.356	17.514	19.557	22.285	27.762	32.329	33.222	36.013	33.074	35,61	37,23	38.121
Agriculture and Livestock	1.956	2.556	3.073	3.359	3.736	3.932	4.056	4.273	4.381	4,71	4,98	5.129
Non-Energy Consumption	2.543	3.087	3.455	4.089	5.314	5.652	6.989	7.372	6.296	7,08	7,58	7.717

Source: Ministry of Energy and Natural Resources, https://enerji.gov.tr/enerji-isleri-genel-mudurlugu-denge-tablolari,2023

11.2- Primary Energy Consumption by Fuel

D B D E T

Total primary energy consumption, disaggregated by fuel type, is a driving force indicator describing the development of energy resources and their respective consumption levels. Consumption of fossil fuels (crude oil, petroleum products, hard coal, lignite, natural and derived gases) is a proxy indicator of resource consumption, greenhouse gas emissions and air pollution levels (SO_2 and NO_X). The degree of environmental impact depends on the relative shares of different fossil fuels and the extent to which pollution mitigation measures are used.

Turkiye's primary energy consumption increased from 52,465 Mtoe in 1990 to 159,432 Mtoe in 2021. As of 1990, the share of solid fuels in Turkiye's primary energy consumption was 30.2%. The share of petroleum and petroleum products was 46.1%, while the share of natural gas was 5.4% and the share of renewable energy sources was 18.4%. By 2021, 26% of Turkiye's primary energy consumption was met by solid fuels. The share of petroleum and petroleum products decreased to 27.6%, while the share of natural gas increased to 30.9%. The share of renewable energy sources is 15.6%.

As of 2021, 2.6% of primary energy consumption in the EU-27 was met from solid fuels, 34.8% from oil and oil products, 23% from natural gas, 22.8% from electricity, 11.8% from renewable energy and 5.0% from other sources[98].

Graph 127- PRIMARY ENERGY CONSUMPTION BY FUEL (%)

Source: Ministry of Energy and Natural Resources, https://enerji.gov.tr/enerji-isleri-genel-mudurlugu-denge-tablolari,2023
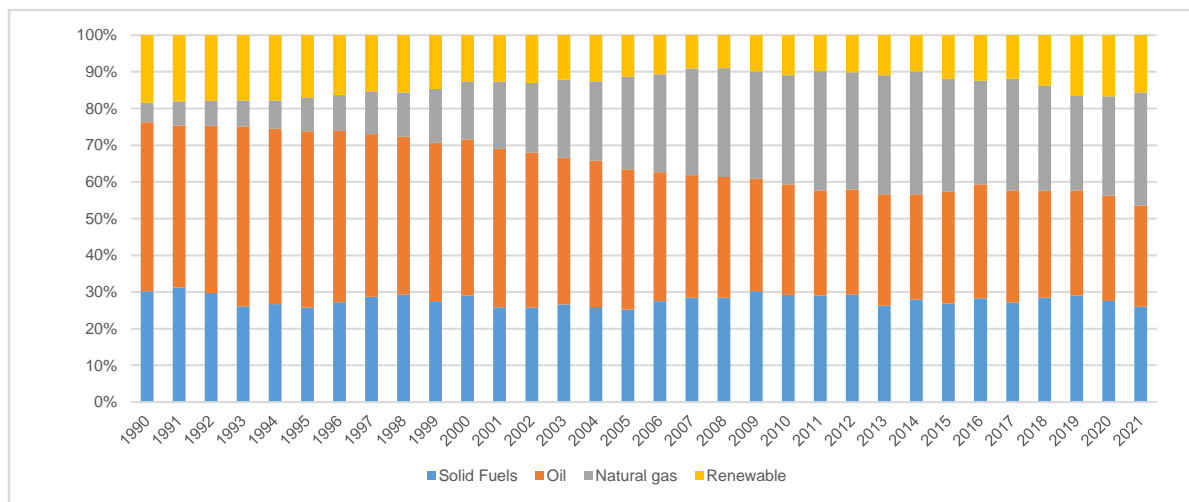
11.3- Final Energy Consumption by Sector

D B D E T

Final energy consumption by sector is a driver indicator and presents the progress achieved in reducing energy consumption and the related environmental impacts of the different sectors (transportation, industry, services and households) that are end users.

The total final energy consumption of sectors in Turkiye in 2021 was 123.14 Mtoe, an increase of 191.3% compared to 1990, 75.9% compared to 2005, and 9% compared to 2020. Large increases in final energy consumption in Turkiye can be attributed to the growth of the economy, but in order to be defined as development, energy intensity must also decrease and should be considered together with energy efficiency. For example, in the EU-27 countries, final energy consumption has decreased by 9% in the last 10 years, according to 2019 data, due to efficiency gains[99].

In 2021, the industrial sector (33.8%) and the residential and services sector (31%) accounted for the

largest share of final energy consumption in Turkiye, followed by the transportation sector (24.8%) and the agriculture/forestry and fishing sectors (4.2%). The share of non-energy consumption was 6.3%.

In comparison with the European Union countries, in EU-27 countries, the largest shares in 2021 were transportation (29%), housing (28%) and industry (26%), followed by services (14%) and agriculture-livestock (3%)[100].

Graph 128- FINAL ENERGY CONSUMPTION BY SECTOR BY YEAR (Mtoe)

Source: Ministry of Energy and Natural Resources, https://enerji.gov.tr/enerji-isleri-genel-mudurlugu-denge-tablolari,2023
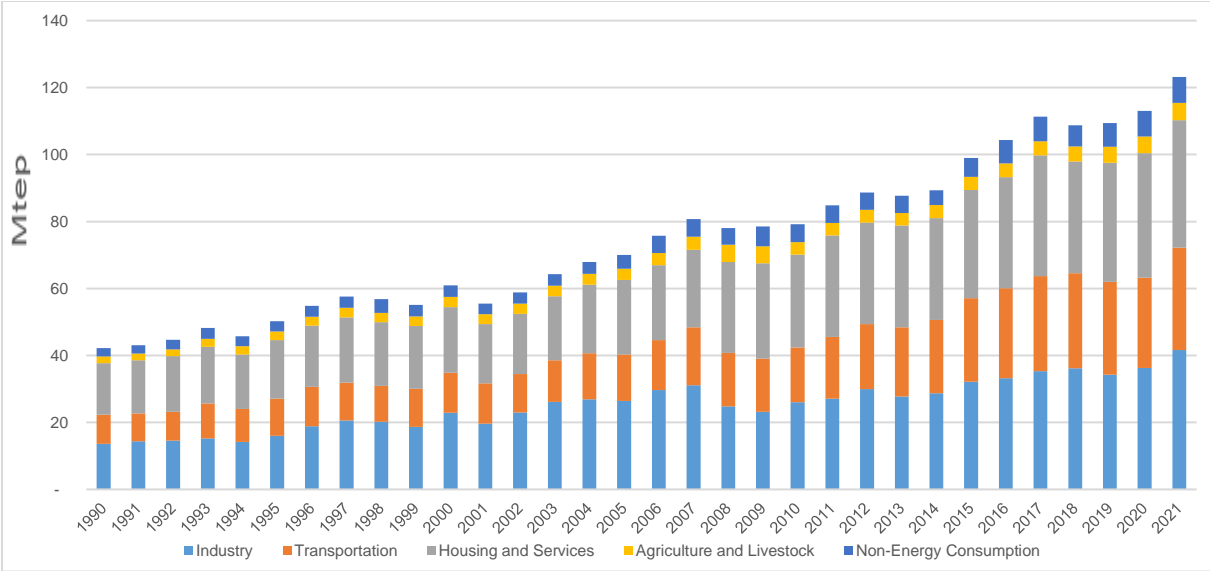
In 2021, net electricity consumption by sectors in Turkiye increased by 512% compared to 1990, 120% compared to 2005 and 9.1% compared to 2020, reaching 286.7 TWh (Terawatt hours). In 2021, the industrial sector (48%) and the services sector (26%) had the largest share in electricity consumption in Turkiye, followed by the residential sector (21%) and agriculture and other sectors (5%).

Graph 129- NET ELECTRIC ENERGY CONSUMPTION BY SECTOR BY YEAR (TWh)
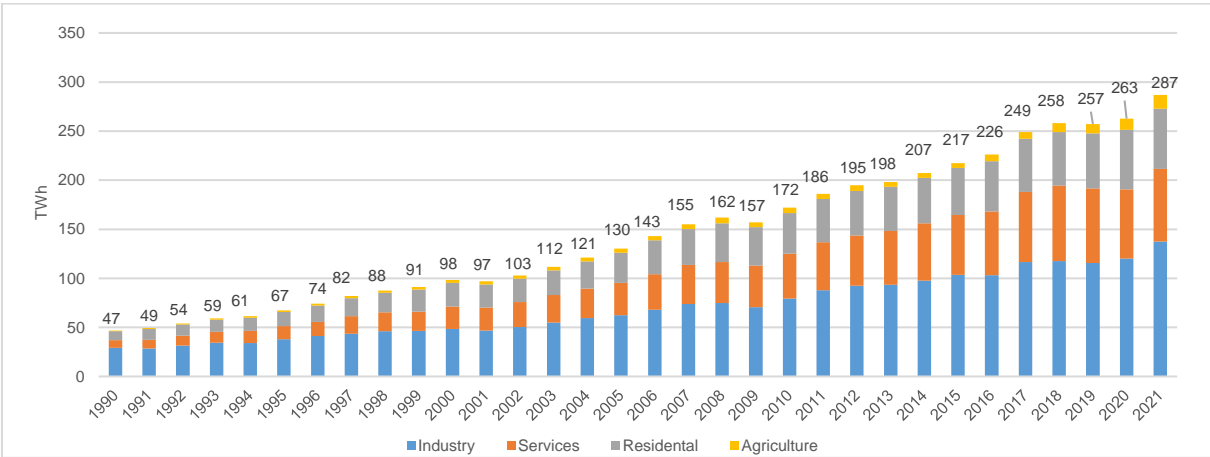
Source: TEDAŞ Turkiye Electricity Distribution and Consumption Statistics, Ministry of Energy and Natural Resources, 2023

11.4- Energy Consumption Per Capita

D B D E T

The indicator is a driving force indicator describing consumption levels. It is one of the indicators used to make comparisons between countries, regions, etc.

While per capita energy consumption in Turkiye was 0.94 TOE in 1990, it was 1.88 TOE in 2021. In European Union countries, primary energy consumption per capita was 3.51 TOE in 1990 and 2.99 TOE in 2020[101].

Graph 130- ENERGY CONSUMPTION PER CAPITA BY YEAR (toe/capıta)

Source: Ministry of Energy and Natural Resources, 2023, https://enerji.gov.tr/enerji-isleri-genel-mudurlugu-denge-tablolari
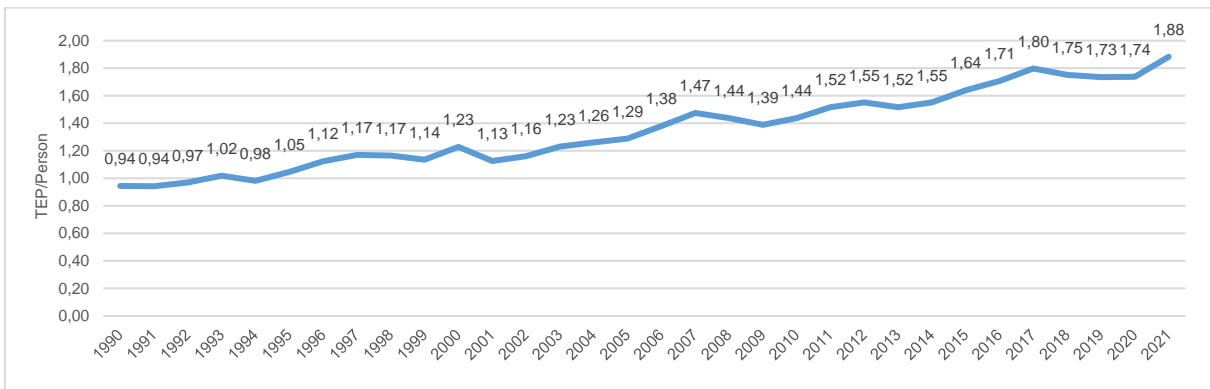
Looking at the per capita electricity consumption figures, in Turkiye, while the gross electricity consumption per capita was approximately 1,006 kWh in 1990, it was 3,931 kWh in 2021.

Graph 131- ELECTRIC ENERGY CONSUMPTION PER CAPITA (kWh/capıta)
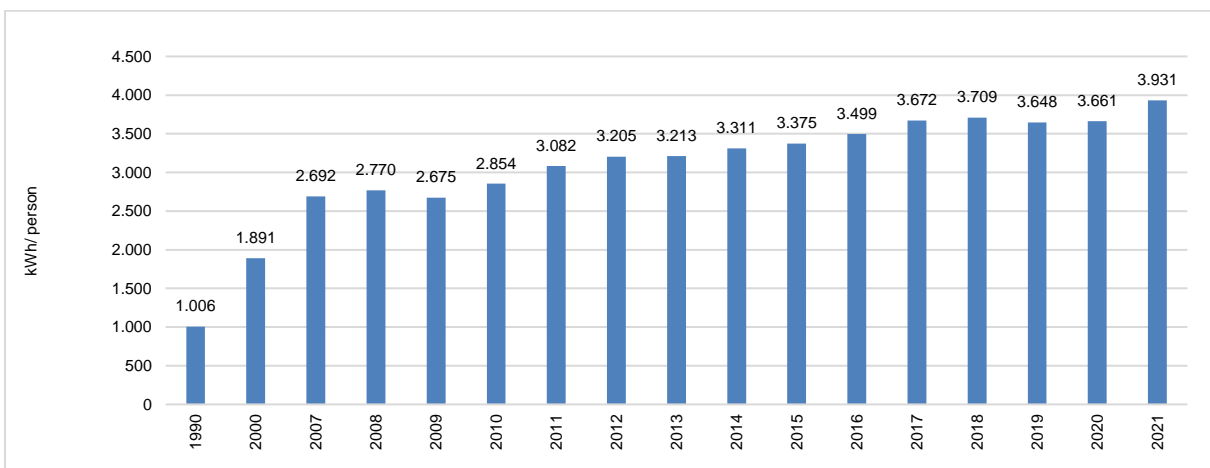
Source: Turkiye Electricity Generation-Transmission Statistics 2020, https://www.teias.gov.tr/tr-TR/turkiye-elektrik-uretim-i- letim-istatistikleri, 2023

11.5- Primary Energy Production

🅓 🅑 🅓 🅔 🅣

This indicator is a driving force indicator. Turkiye's primary energy production was 25.1 Mtoe in 1990 and 46.7 Mtoe in 2021. The increase from 1990 to 2021 was 86%[102].

Graph 132- PRIMARY ENERGY PRODUCTION BY YEAR (Mtoe)
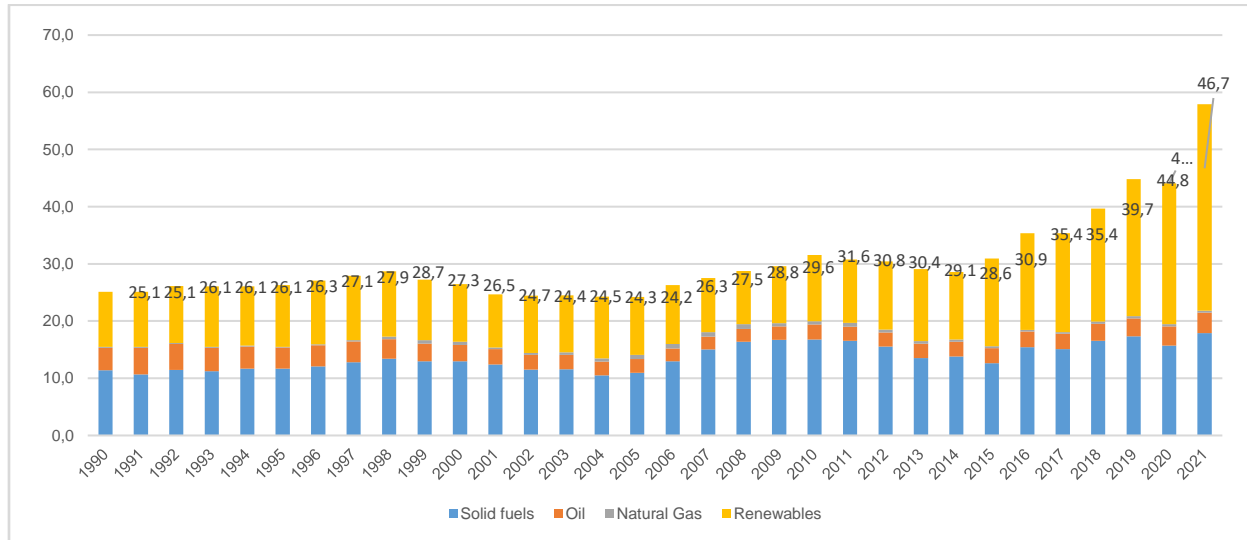
Source: Ministry of Energy and Natural Resources, https://enerji.gov.tr/eigm-raporlari, 2023

Graph 133-BY YEAR 2021 DISTRIBUTION OF PRIMARY ENERGY PRODUCTION BY SOURCE (Mtoe and %)

Source: Ministry of Energy and Natural Resou,2023, https://enerji.gov.tr/eigm-raporlari
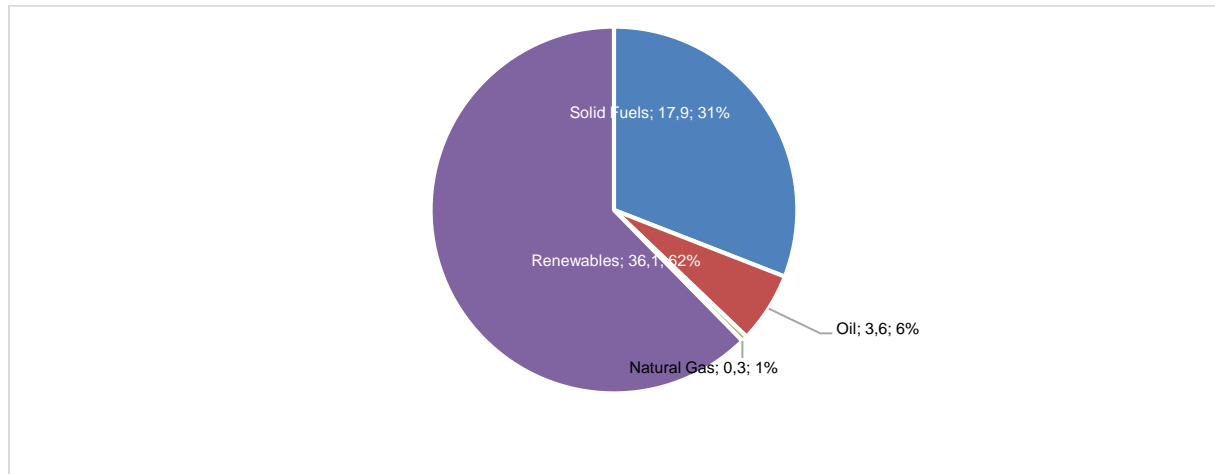
Electric power generation in Turkiye in 2021 was 334.7 TWh (Terawatt hours). Turkiye's total electric power generation increased by 482% compared to 1990, by 107% compared to 2005, but by 9.1% compared to 2020.

Looking at the distribution of total electricity generation in Turkiye in 1990, solid fuels accounted for 35%, natural gas 18%, liquid fuels 7% and hydroelectricity 40%.
In 2021, natural gas has a share of 33%, solid fuels 31%, other renewable resources 19%, and hydraulics 17%.

Graph 134- TOTAL ELECTRIC ENERGY PRODUCTION BY SOURCE (TWh)

Source: Turkiye Electricity Generation-Transmission Statistics 2020, https://www.teias.gov.tr/tr-TR/turkiye-elektrik-uretim-i- letim-istatistikleri,2023
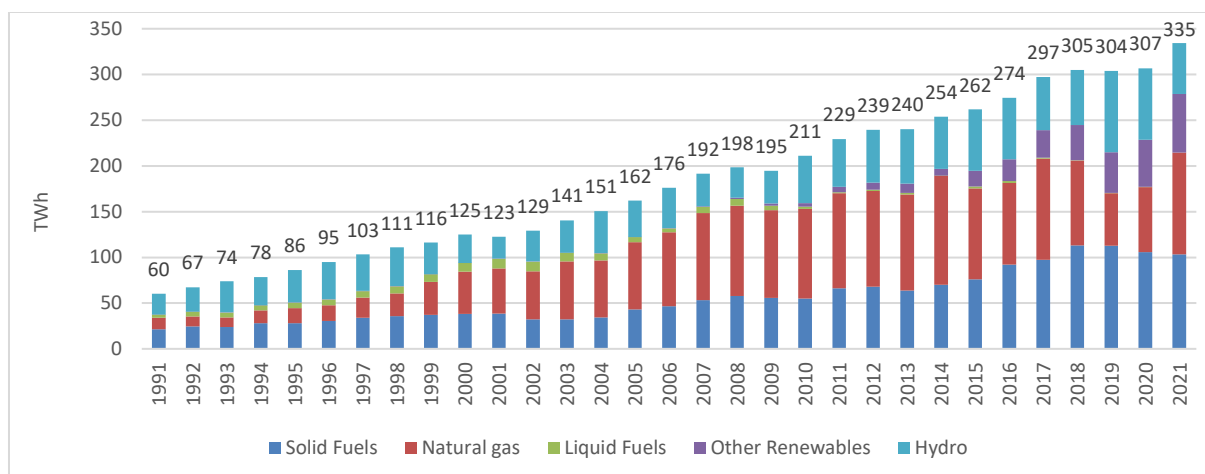
11.6- Share of Renewable Energy Sources in Gross Final Energy Consumption

I B D E **R**

This indicator is a response indicator that measures the proportion of a country's total energy produced from renewable energy sources. Renewable energy sources are environmentally friendly and have much lower CO_2 emissions per unit of energy produced.

Renewable energy supply in Turkiye is mostly composed of hydraulic resources, wind, solar, geothermal and biomass (wood, plant and animal residues). By the end of 2021, our primary energy supply was 159.4 Mtoe, while domestic energy production reached 46.7 Mtoe. Renewable energy sources accounted for 62% of domestic energy production (36.1 Mtoe in total). The amount of energy supplied from renewable sources increased by 274% compared to 1990.

In 1990, the contribution of renewables to Turkiye's primary energy consumption was 18.4%, but by 2021, it had fallen to 15.6% due to a decline in fuelwood consumption and an increase in total energy consumption.

In EU-27 countries, the share of renewable energy in primary energy consumption increased from 4.3% in 1990 to 21.8% in 2021[103].

Graph 135- GROSS ENERGY PRODUCTION FROM THE RENEWABLE ENERGY SOURCES IN TURKEY and SHARE OF RENEWABLE ENERGY IN GROSS FINAL ENERGY CONSUMPTION

Source: Ministry of Energy and Natural Resources, https://enerji.gov.tr/eigm-raporlari,2023
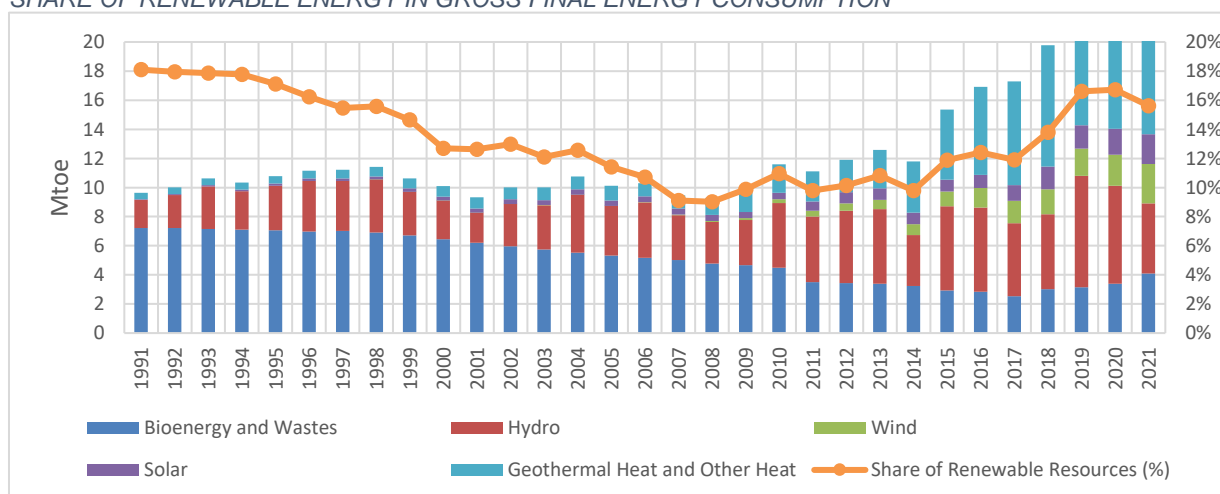
11.7- Share of Renewable Resources in Gross Electricity Consumption

This indicator is a response indicator and is calculated as electricity from renewable sources divided by total gross electricity consumption (total gross electricity generated from all fuels + electricity imports - electricity exports).

By the end of 2021, Turkiye's gross electricity consumption was 334,723 GWh. The ratio of electricity generated from renewable sources (118,567 GWh) to gross electricity consumption was 35%.

According to the European Statistical Office (EUROSTAT), the share of electricity generated from renewable sources in the gross electricity consumption of EU-27 countries in 2021 was 37.5%[104].

Table 37- GROSS ELECTRICITY PRODUCTION FROM RENEWABLE ENERGY SOURCES IN 2021

Source	Production (GWh)	Share (%)
Hydro	55.926,8	47
Wind	31.436,7	26,5
Geothermal	10.793,2	9,1
Bioenergy and Waste*	6.467,8	5,45
Solar	13.942,9	11,76
Total	118.567,5	100

Source: Turkiye Electricity Generation-Transmission Statistics 2021, https://www.teias.gov.tr/tr-TR/turkiye-elektrik-uretim-i- letim-istatistikleri,2023
* Industrial Waste included, Waste Heat not included.

Graph 136- SHARE OF RENEWABLE ELECTRICITY IN GROSS ELECTRICITY CONSUMPTION (%)

Source: Turkiye Electricity Generation-Transmission Statistics 2021, https://www.teias.gov.tr/tr-TR/turkiye-elektrik-uretim-i-letim-istatistikleri,2023
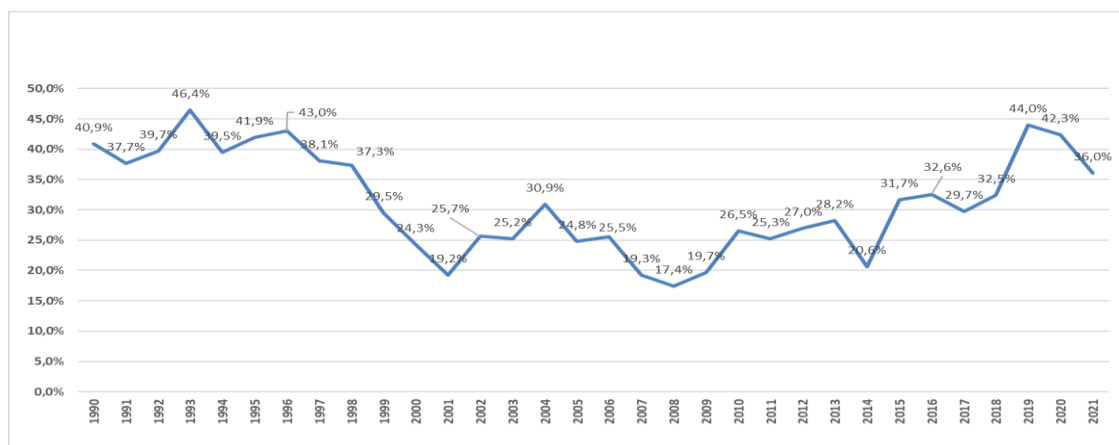
11.8- Primary and Final Energy Intensity

Energy intensity is an energy efficiency indicator that measures how much energy is required to produce a unit of GDP on a country or regional basis. If the amount of energy required is in terms of total supplied, untransformed energy in the country, it is referred to as primary energy intensity; if it is in terms of energy ultimately consumed by sectors such as industry, housing and transportation, it is referred to as final energy intensity. Primary energy intensity is a reaction indicator, while final energy intensity is a driving force indicator. A decrease in the indicator values means an improvement in energy efficiency. The trend in energy intensity is influenced by factors such as structural changes in the economy and industry, changes in the structure of energy consumption, efficiency development of sectors and the devices and equipment preferred by end-users.

Turkiye's primary energy intensity in 2021 is calculated as 0.141 toe/thousand 2015$, a 26.6% decrease compared to 2000. This value is 0.145 toe/thousand 2015$ for 2020, which is much lower than the world average of 0.171 toe/thousand 2015$, but still above the OECD average (0.102 toe/thousand 2015$). The average primary energy intensity of the European Union countries is 0.094 toe per thousand 2015$, which is better than both the OECD and Turkiye.

The final energy intensity was realized as 0.110 toe/thousand 2015$ in 2021. In terms of this value, an improvement was achieved with a 26.2% decrease compared to 2000. This value is 0.112 toe/thousand 2015$ for 2020, which is lower than the world average of 0.117 toe/thousand 2015$. On the other hand, it is above the OECD average of 0.072 toe/thousand 2015$. The final energy intensity of the European Union countries is 0.064 toe/thousand 2015$, which is also better than the OECD countries and Turkiye.

Graph 137- PRIMARY AND FINAL ENERGY INTENSITY BY YEAR
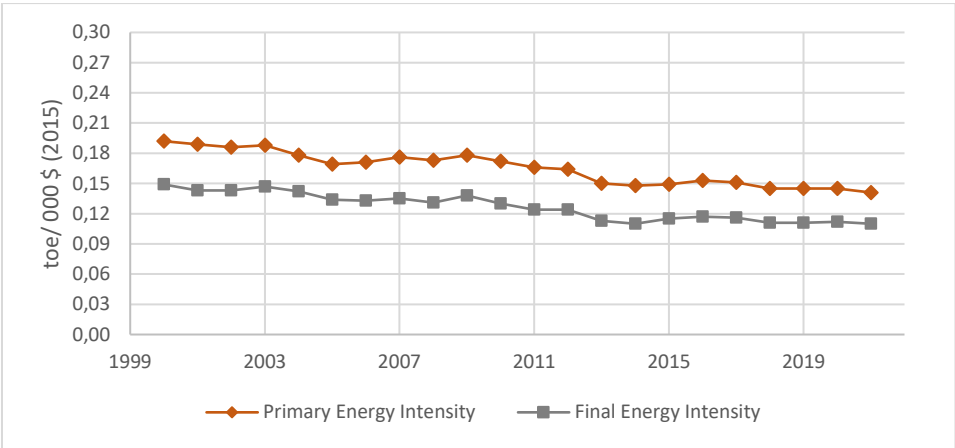
Source: Ministry of Energy and Natural Resources, Department of Energy Efficiency and Environment, 2023

Graph 138- SECTORAL FINAL ENERGY INTENSITIES BY YEARS
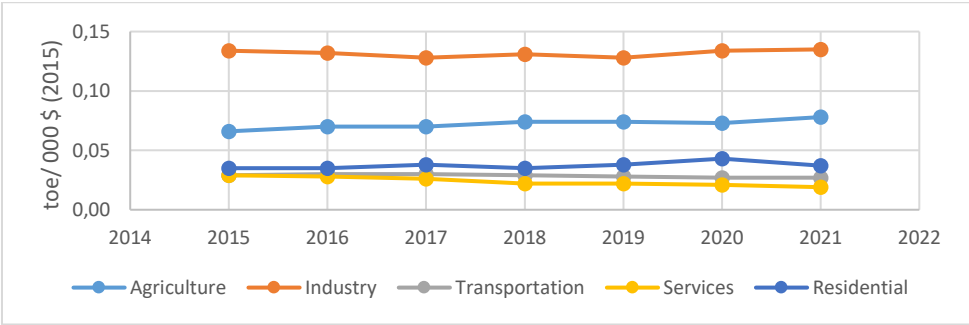
Source: Ministry of Energy and Natural Resources, Department of Energy Efficiency and Environment, 2023

Looking at the energy intensity of main sectors, the industrial sector stands out as the most energy-intensive sector, as expected. It is followed by agriculture, housing, transportation and services sectors, respectively. In the 2015-2020 period, there is a partial decrease in the services and transportation sectors, while an upward trend is observed in the housing and agriculture sectors[105].

The National Energy Efficiency Action Plan, prepared under the coordination of the Ministry of Energy and Natural Resources and covering the period 2017-2022, entered into force in 2017 and started to be implemented. It is estimated that a total of USD 7.5 billion was invested in energy efficiency in the 2017-2022 period, resulting in a cumulative energy saving of 5.2 Mtoe, equivalent to USD 1.8 billion. Within the framework of the NEEAP Action Plan, all of the targets for the period 2017-2022 have been achieved

11.9- Energy Efficiency in Buildings

(I) (B) (D) (E) **(R)**

Regarding the energy efficiency of the building sector, the "By-Law on Energy Performance in Buildings" dated 05.12.2008 and numbered 27075 entered into force and with the said by-law, it became mandatory to obtain the energy identity certificate that determines the energy consumption class of the building.

By the end of 2022, a total of 1,402,694 buildings, 369,712 of which were existing and 1,032,982 of which were new, were issued energy identity certificates. By the end of 2023, it is planned to issue 1,450,000 energy identity certificates. Renewable energy systems are used in 73,057 of these buildings for which energy identity certificates have been issued. By the end of 2023, it is planned to use renewable energy systems in 85,000 buildings.

Within the scope of the "By-Law on the Allocation of Heating and Hot Water Costs in Central Heating and Hot Water Systems" numbered 26847, which entered into force on 14.04.2008, all existing and new buildings with central heating systems are obliged to implement cost sharing practices. Within the scope of these practices, the number of measurement companies authorized to issue measurement and cost sharing certificates in buildings with central heating systems was 174 at the end of 2022.

With the "By-Law on Green Certificate for Buildings and Settlements" numbered 31864, which entered into force on 12.06.2022, it is aimed to establish evaluation and certification systems to reduce the negative impacts of buildings and settlements on the environment by using natural resources and energy efficiently, to regulate the procedures and principles regarding the qualifications of green certificate experts, green certificate evaluation experts and training institutions and the evaluation criteria of green buildings and green settlements. For this reason, the National Green Certification System (YeS-TR) software program has been prepared by the Ministry in order to carry out certification activities and it is planned that 10 buildings will have National Green Building Certificate by the end of 2023.[106].

11.10- Thermal Electricity and Cogeneration Power Plant Efficiencies

(I) **(P)** (D) (E) (T)

Although thermal power plants are reliable in terms of meeting energy needs, this indicator is a pressure

indicator as they cause many environmental problems. Thermal power plants are facilities that convert the chemical energy contained in solid, liquid and gaseous fuels into electrical energy, mostly using conventional energy sources such as fossil fuels and biomass energy sources. In 2010, 74% of Turkiye's gross electrical energy generation was provided by thermal power plants, while this ratio decreased to 60% in 2022.

Efficient conversion of heat energy to other forms of energy during the power generation phase in thermal power plants will not only provide cost savings, but also reduce the rate of fossil fuel depletion and negative environmental impacts.

Combined heat and power systems (CHP), or cogeneration for short, are facilities that both save money and contribute to the environment by producing energy in the form of both electricity and heat together from the same system. Cogeneration plant efficiency is defined as the ratio of the sum of electricity and heat energy produced in a year to the fuel energy consumed. While this value is between 25-40% in a stand-alone power plant, this value can reach up to 90% in cogeneration plants. In the last decade in Turkiye, these ratios have averaged 41% for stand-alone power plants and 70% for cogeneration plants.[107].

Table 38- THERMAL POWER AND COGENERATION PLANT EFFICIENCIES (2010-2022)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Cogeneration Plant Efficiency (%)	41,37	41,48	41,60	42,83	43,31	41,89	41,42	43,22	42,72	39,85	41,61	42,55	41,15
Share of Thermal Electric Power Generation in Gross Electricity Generation (%)	69,72	69,90	70,69	71,34	70,07	68,17	67,10	66,93	68,27	72,94	73,09	73,65	73,96
Turkiye Thermal Electricity Generation (GWh)	73,73	74,78	72,97	71,43	79,41	68,33	67,45	71,07	68,48	57,27	59,19	66,12	60,07
Turkiye Gross Electric Power Generation (GWh)	155.717	171.532	174.760	171.535	200.079	178.870	185.084	211.288	208.733	174.041	181.526	221.312	197.261
Power Plants Efficiency (%)	211.208	229.395	239.497	240.154	251.963	261.783	274.408	297.278	304.802	303.898	306.703	334.723	328.379

Graph 139- SHARE OF THERMAL ELECTRICITY AND COGENERATION POWER PLANT GENERATION IN TURKIYE'S THERMAL GENERATION % (2010-2022)
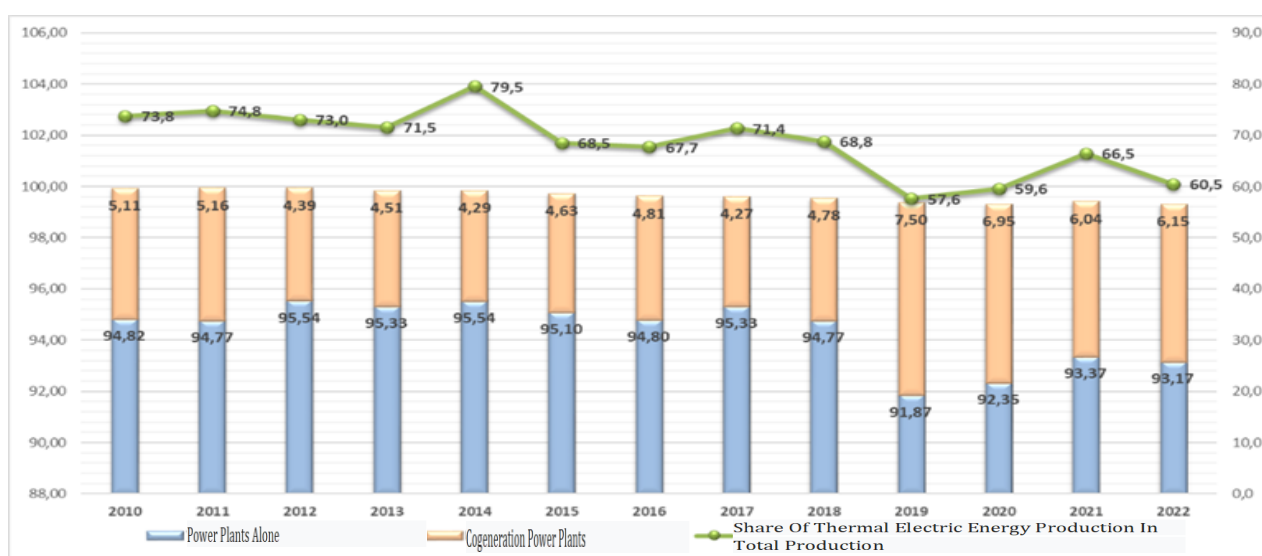
Source: TEİAŞ,2023

12

INDUSTRY
AND MINING

12.1- Share of Total Domestic and International Sales Value of Products of Enterprises Operating in Organized Industrial Zones in All Industrial Enterprises

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In our country, Organized Industrial Zones were established for the purposes of disciplining the industry, contributing to the planned development of the city, ensuring productivity and profit increase in production, expanding the industry in underdeveloped regions, disciplining the use of agricultural lands for industry, establishing a healthy, cheap, reliable infrastructure and common social facilities, preventing environmental pollution with common treatment facilities, etc.

Pursuant to the Law No. 6948 on Industrial Registry, the Ministry of Industry and Technology keeps records of industrial enterprises. Industrial registry records have a dynamic structure and there are new registrations as well as registration cancellations. In this context, the share of the total domestic and foreign sales value of the products produced by enterprises operating in organized industrial zones in enterprises registered in the industrial registry in all industrial enterprises; 19% for 2015, 24% for 2016, 25% for 2017, 30% for 2018, 37.5% for 2019, 39.5% for 2020 and 39.1% for 2021. This information is taken from industrial registry records and is not official statistical data[108].

Graph 140- SHARE OF TOTAL DOMESTIC AND FOREIGN SALES VALUE OF PRODUCTS OF ENTERPRISES OPERATING IN ORGANIZED INDUSTRIAL ZONES IN ALL INDUSTRIAL ENTERPRISES BY YEARS
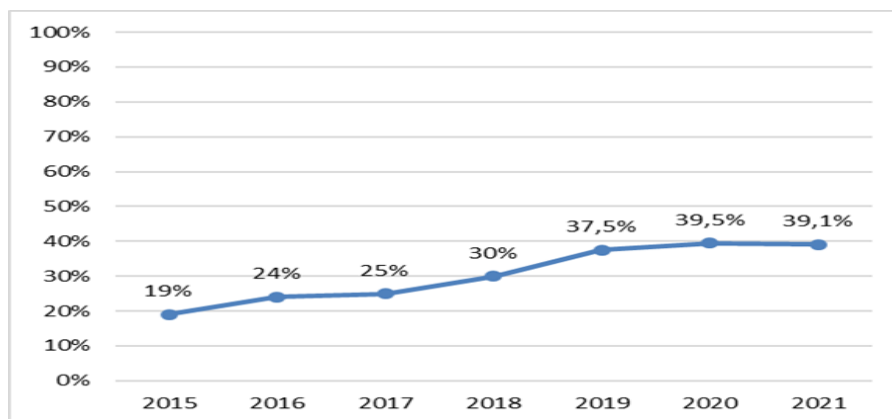
Source: Ministry of Industry and Technology, 2022

12.2- Number of Mining Facilities by Group

Ⓘ **Ⓟ** Ⓓ Ⓔ Ⓣ

This indicator is a pressure indicator and shows the number of registered mines in a year according to different licensing groups. Mining has an important place in the economy due to its direct contribution to the economy and especially the inputs it provides to the manufacturing sector. However, mining activities should be decided and implemented in the overall interest of the country, taking into account both commercial and environmental criteria.

In 2022, a total of 14,998 mining licenses were issued by the Ministry of Energy and Natural Resources, General Directorate of Mining Affairs, of which 5,039 were exploration licenses and 9,949 were operating licenses. In the 2008-2021 period, there has been a decrease in the total number of licenses granted by years. The share of mining and quarrying in GDP was realized as 1.36% in 2022.

As of 2021, the distribution of 4,033 licensed mines in operation according to their groups shows that 1,433 of them are group II(a), 1,113 of them are group II(b), followed by group IV mines with 1,111[109].

Graph 141- TOTAL NUMBER OF LICENSES ISSUED BY YEARS (2008-20221)
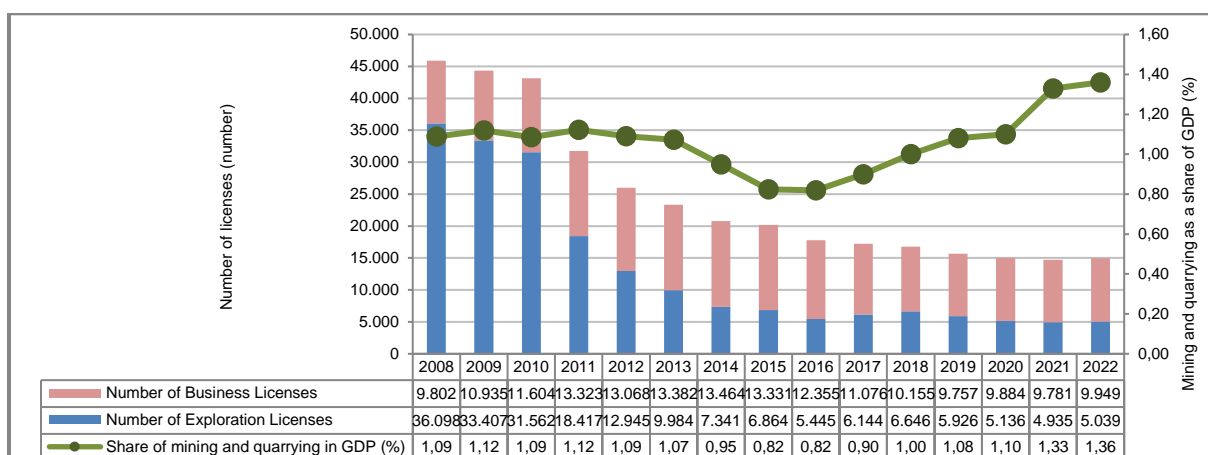
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Number of Business Licenses	9.802	10.935	11.604	13.323	13.068	13.382	13.464	13.331	12.355	11.076	10.155	9.757	9.884	9.781	9.949
Number of Exploration Licenses	36.098	33.407	31.562	18.417	12.945	9.984	7.341	6.864	5.445	6.144	6.646	5.926	5.136	4.935	5.039
Share of mining and quarrying in GDP (%)	1,09	1,12	1,09	1,12	1,09	1,07	0,95	0,82	0,82	0,90	1,00	1,08	1,10	1,33	1,36

Source: Ministry of Energy and Natural Resources, General Directorate of Mining and Petroleum Affairs (MAPEG),2023 https://mapeg.gov.tr/Custom/Madenistatistik

Graph 142- NUMBER OF LICENSES FOR MINES IN OPERATION BY MINING GROUPS (2010-2021)
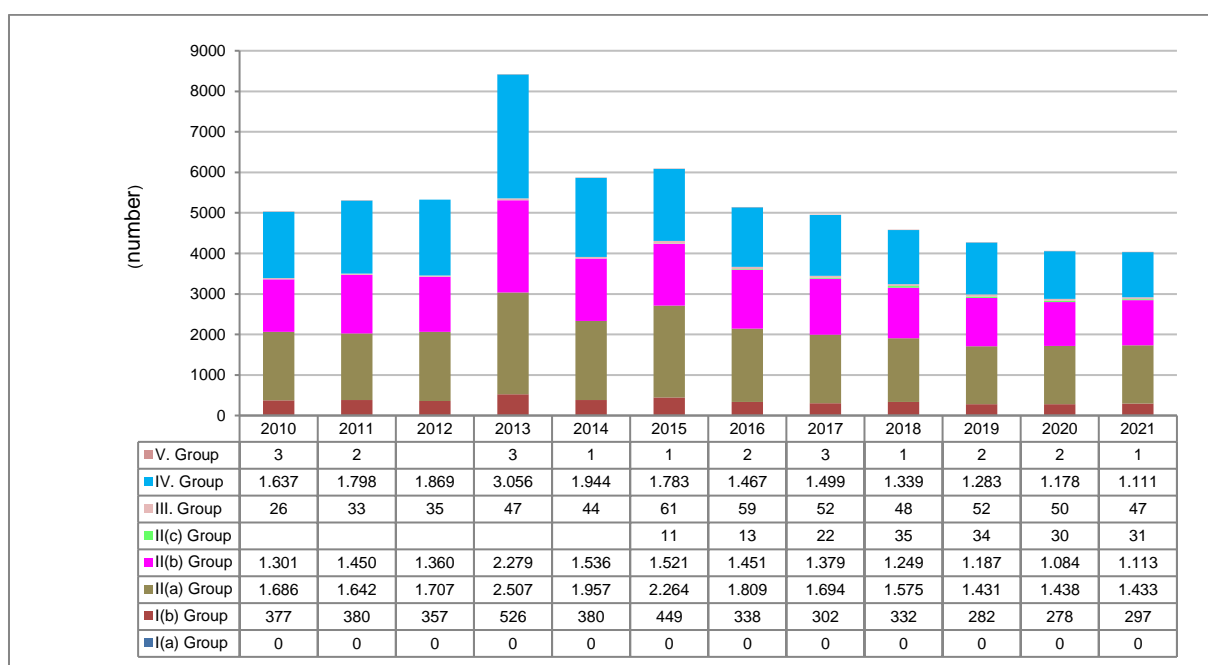
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
V. Group	3	2		3	1	1	2	3	1	2	2	1
IV. Group	1.637	1.798	1.869	3.056	1.944	1.783	1.467	1.499	1.339	1.283	1.178	1.111
III. Group	26	33	35	47	44	61	59	52	48	52	50	47
II(c) Group						11	13	22	35	34	30	31
II(b) Group	1.301	1.450	1.360	2.279	1.536	1.521	1.451	1.379	1.249	1.187	1.084	1.113
II(a) Group	1.686	1.642	1.707	2.507	1.957	2.264	1.809	1.694	1.575	1.431	1.438	1.433
I(b) Group	377	380	357	526	380	449	338	302	332	282	278	297
I(a) Group	0	0	0	0	0	0	0	0	0	0	0	0

Source: Ministry of Energy and Natural Resources, General Directorate of Mining Affairs (MIGEM),2023 http://www.mapeg.gov.tr/maden_istatistik.aspx

12.3- Number and Area of Mines Closed After Operated

The indicator is a reaction indicator. During the closure phase, nature restoration activities should be carried out. Nature restoration aims to restore areas degraded as a result of mining activities to a state close to their former economic and environmental status.

According to the data of the General Directorate of Forestry, the number of mines/pits rehabilitated after operation from 2019 to 2022 is 1880 and the area is 6128 hectares.

Graph 143- NUMBER AND AREA OF MINES/ FACILITIES REHABILITATED AFTER BEING OPERATED (2010-2022)

	2012	2013	2014	2015	2016	2018	2019-2022
Area of Mines / Facilities Rehabilitated After Being Operated	2810	3499	5086	6243	7208	4888,77	6128
Number of Mines/Facilities Rehabilitated After Operated	1711	1462	2277	3064	3101	1001	1880
Number of Closed Mines	6.910	3.781	3.339	2.251	3.271	3.485	1.850
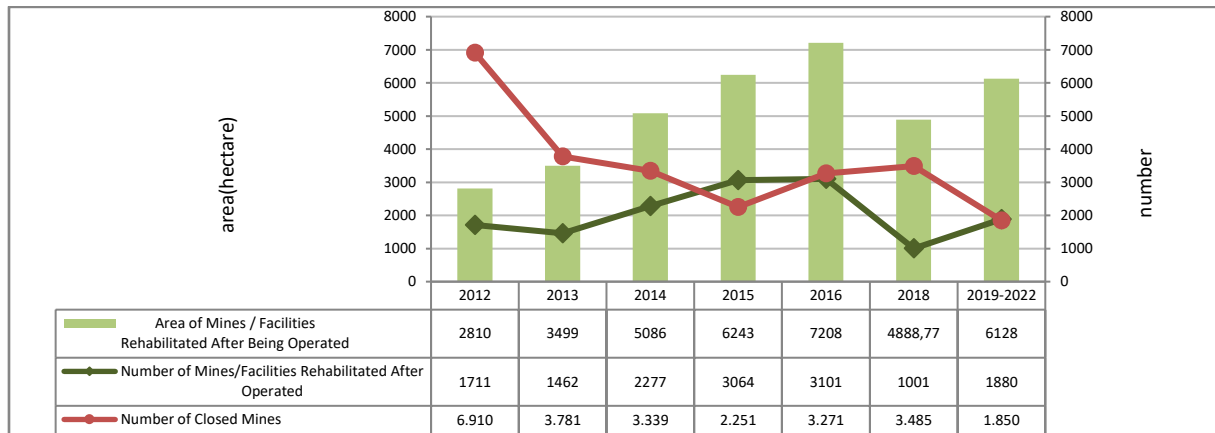
Sources:
For data on Rehabilitated Mine Quarry/Facility after Operation; General Directorate of Forestry, 2023
Ministry of Energy and Natural Resources, General Directorate of Mining Affairs (MİGEM) Oracle Discovery Database

12.4- Laboratories Operating Under Environmental Legislation

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The indicator is a reaction indicator. As of 2022, there are 233 laboratories operating within the scope of environmental legislation in Turkiye. Issues such as laboratories, qualification subjects, provinces where they are located can be queried at https://elab.cevre.gov.tr/LabSorgu/. Since 2008, "Proficiency Tests" have been organized for laboratories authorized by the Ministry within the scope of Remote Audit. As of 2022, the number of Proficiency Test parameters organized is 35 parameters.

As of September 2022, a protocol was signed between the Ministry of Environment, Urbanization and Climate Change / TUÇEV (Turkish Environmental Protection Foundation) and İZAYDAŞ (İzmit Waste and Residues Treatment Inc.) within the scope of proficiency test organization and it was decided that PT / ILC tests will be organized by İZAYDAŞ with the coordination of the Ministry for laboratories working within the scope of environmental legislation. In 2022, the annual number of parameters will be 35, and from 2023 onwards, the proficiency test will be monitored not on the basis of number, but on the basis of the organization of the organizations organized under this protocol.

Graph 144- NUMBER OF LABORATORIES OPERATING UNDER ENVIRONMENTAL LEGISLATION BY YEARS
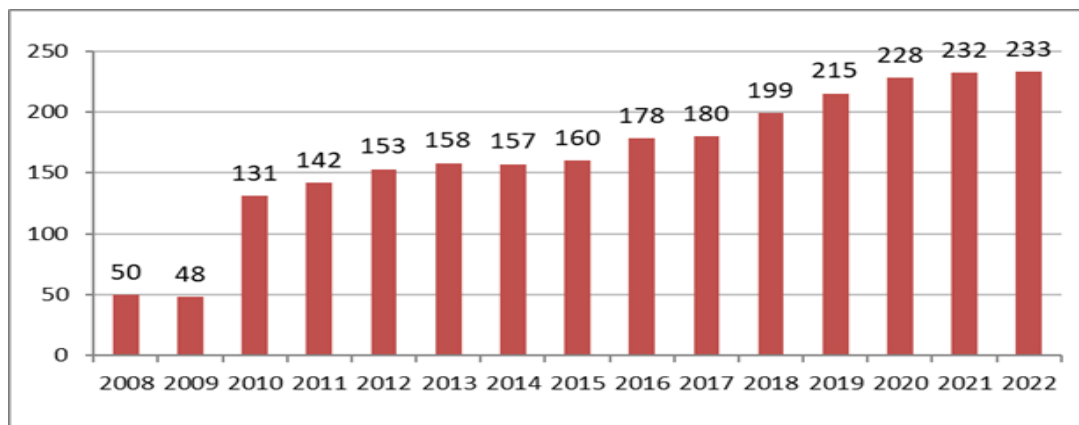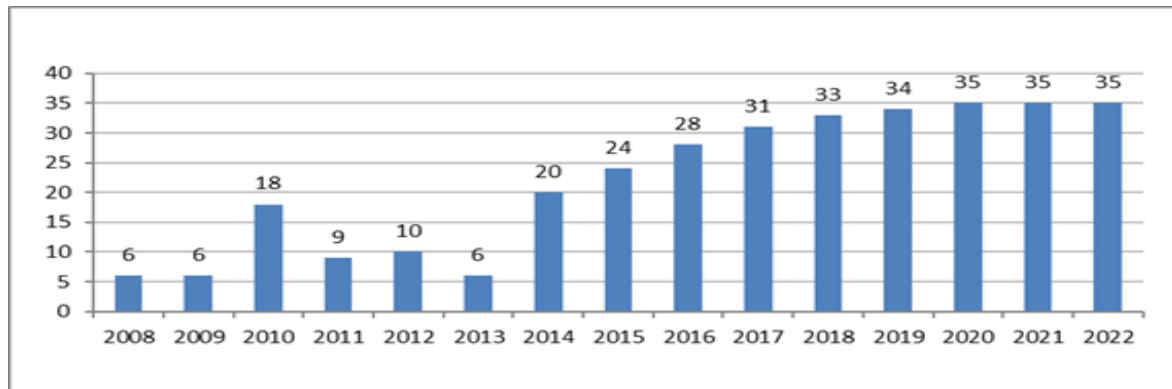
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of EIA, Permit and Inspection, Department of Laboratory, Measurement and Monitoring, 2023

12.5- Environmental Impact Assessment Decisions

I B D E R

The indicator is a reaction indicator. Environmental Impact Assessment (EIA), one of the most important tools of sustainable development, has been implemented in Turkiye since 1993. EIA is an important tool for preventing the potential impacts of planned projects on the environment and determining the selected location and technological alternatives. It has become mandatory to obtain an EIA Positive / EIA Not Required Certificate within the scope of the EIA Law before the projects are put into operation.
EIA decisions are important in terms of being a projection of the point of industrialization and development in our country.

Graph 146- NUMBER OF EIA POSITIVE AND NOT REQUIRED DECISIONS IN TURKIYE IN THE PERIOD 1999-2022 AND GDP PER CAPITA
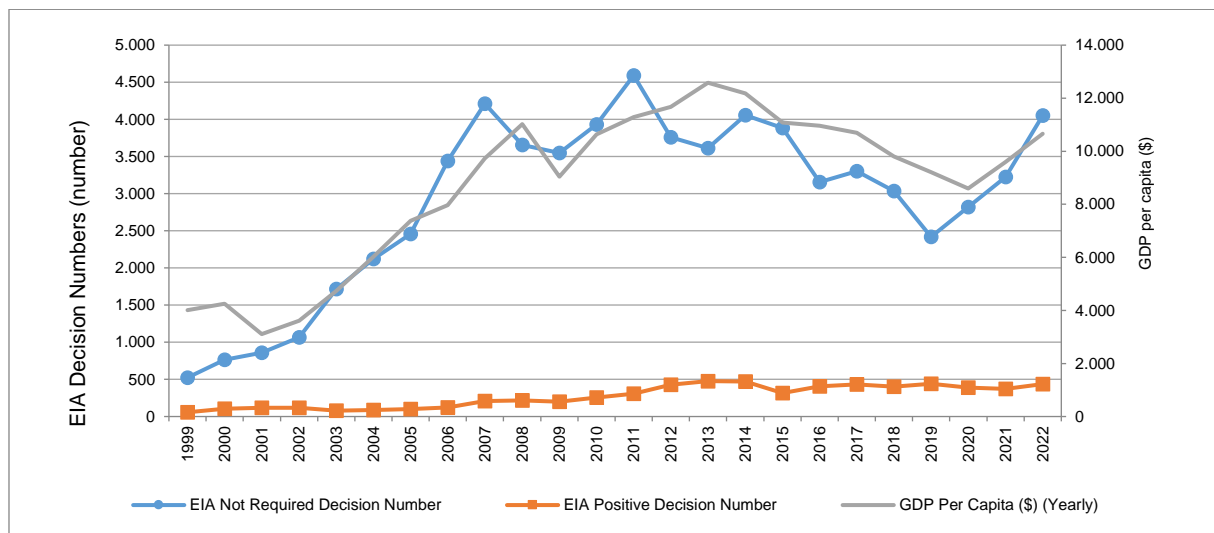
Sources: 1) Ministry of Environment, Urbanization and Climate Change, General Directorate of EIA, Permit and Inspection for EIA data,2023
2)TURKSTAT for GDP per capita data, 2023
Note: EIA decisions subject to EIA Statistics are not revised retrospectively due to the failure to start the investment without force majeure within the period specified in the EIA Law or the cancellation or invalidation of the EIA decision by the Court Decision.

To summarize, "EIA Positive Decisions" are the positive decisions taken as a result of the evaluation of the projects listed in Annex-1 of the Law with relatively large environmental impacts. "EIA Not Necessary Decisions" are positive decisions taken as a result of the evaluation of projects that are listed in Annex-2 of the Law and have relatively less environmental impacts compared to Annex-1.

When the distribution by sectors of the 6,926 "EIA Positive" decisions taken between 1993, when the first EIA Regulation was published, and the end of 2022 is analyzed, it is seen that petroleum and mining investments lead with 29%, followed by energy investments with 22%, waste-chemical sector with 14%, and agriculture-food sector investments with 13%.

From 1993 until the end of 2022, a total of 73,210 "EIA Not Required" decisions were made, and when analyzed by sectors, petroleum and mining investments lead with 48%. This is followed by agriculture-food with 14% and industry with 13%[110].

Graph 147- SECTORAL DISTRIBUTION OF EIA POSITIVE DECISIONS BETWEEN 1993-2022
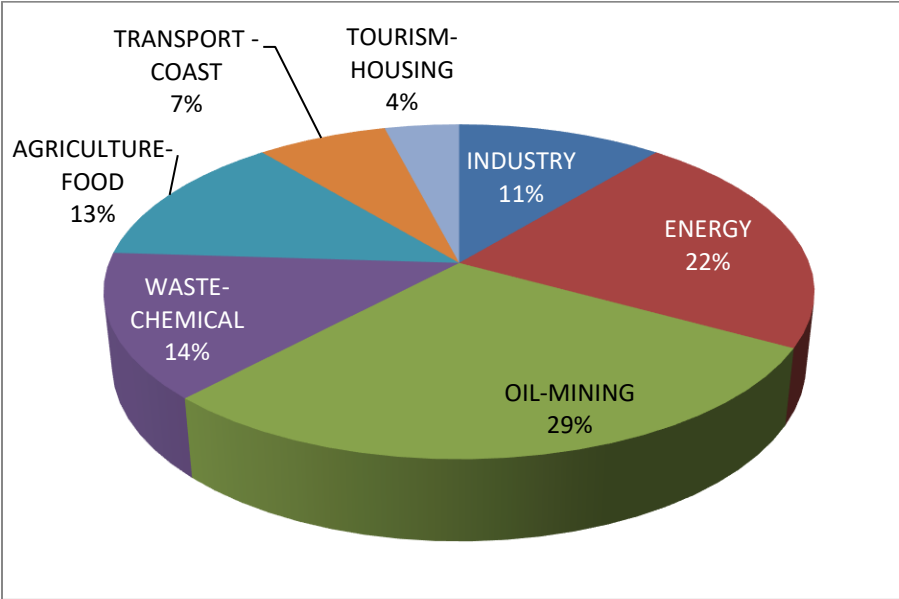
Graph 148- SECTORAL DISTRIBUTION OF EIA NOT REQUIRED DECISIONS BETWEEN 1993-2022
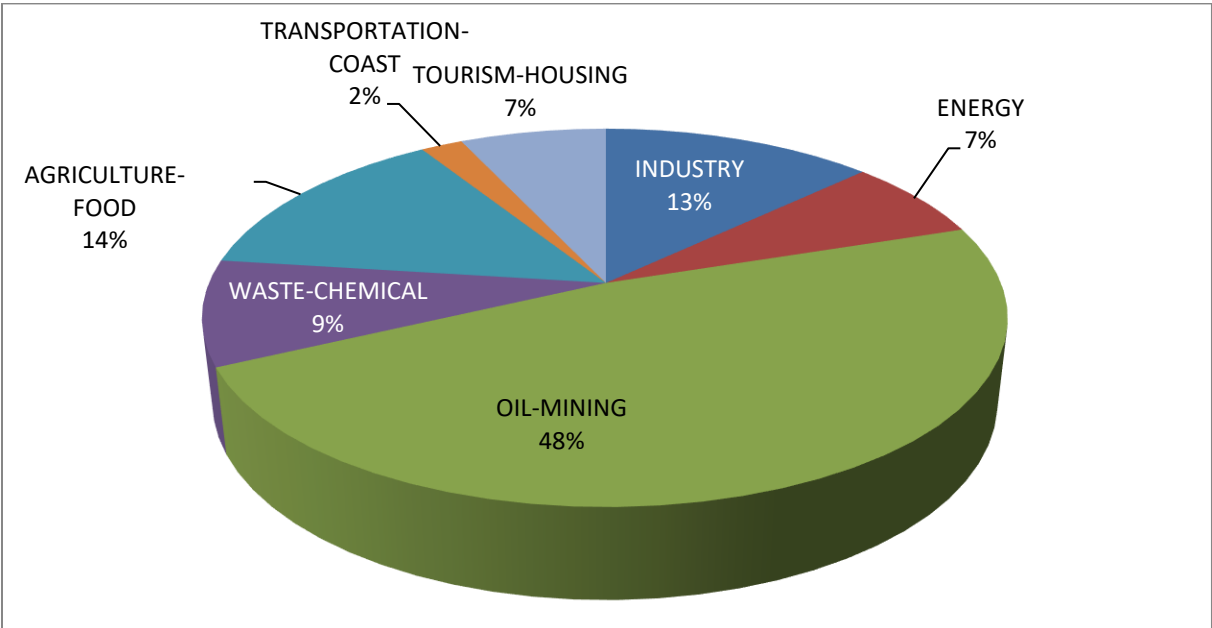
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of EIA, Permit and Inspection, 2023
Note: EIA decisions subject to EIA Statistics are not revised retrospectively due to the failure to start the investment without force majeure within the period specified in the EIA Law or the cancellation or invalidation of the EIA decision by the Court Decision..

13

AGRICULTURE

13.1- Agricultural Land Per Capita

The indicator is a status indicator. Agricultural lands are important for crop production, while pastures, rangelands and winter pastures are important for the development of animal husbandry and nature conservation.

According to TURKSTAT data for 2022, the total agricultural land is 38 462 thousand hectares (including meadow and pasture land). Of the total agricultural area, 52.4% is cultivated land, 9.6% is under perennial crops (perennial orchards) and 38% is permanent meadow and pasture land.

In Turkiye, the amount of agricultural land per capita has decreased as a result of the increase in population and the corresponding decrease in the total amount of agricultural land. In the 1990-2018 period, Turkiye's population increased by approximately 45.2%, while agricultural land per capita decreased by 39.3% in the same period.

In 1990, the total agricultural area per capita was 0.76 ha, which decreased to 0.45 ha in 2021. As of 2022, considering the total arable area (23 845 thousand ha), there is 0.28 ha per capita[111]. According to 2021 data, the agricultural area cultivated per capita in the world was 0.18 ha and 0.22 ha in the European Union[112].

Graph 149- TOTAL AGRICULTURAL AREA AND AGRICULTURAL AREA PER CAPITA BY YEARS
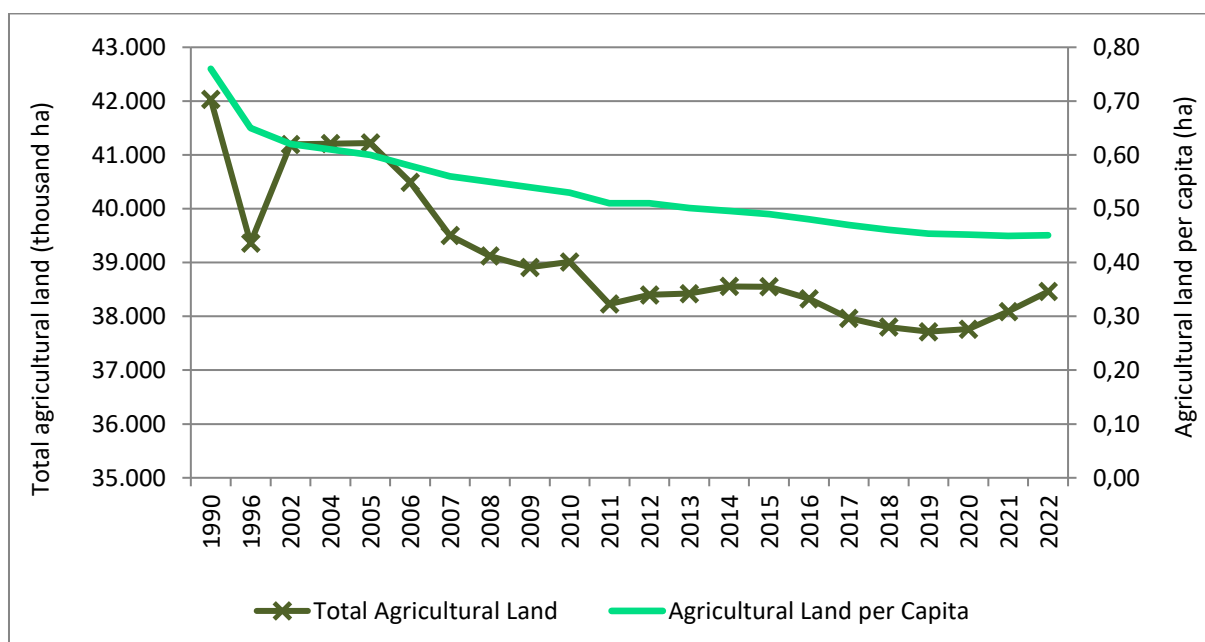
Source: TURKSTAT,2023, Ministry of Agriculture and Forestry,2023 Notes:

1) Since 1995, only fruit and olive closed areas are given and the area covered by scattered trees is not included.
2) Since 1995, grouped according to the Statistical Classification of Products by Activities of the European Union (CPA 2002).
3) Since 2011, multiple plantings are not included.

13.2- Chemical Fertilizer Consumption

The indicator is a pressure indicator for eutrophication factors, and the portion of fertilizer used in the agricultural sector that leaches without being absorbed by plants is an important cause of eutrophication for the environment.

According to FAO criteria, the total cultivated agricultural area where fertilizer use is considered to take place is the sum of the area cultivated with crops, fallow land, vegetable gardens and ornamental plants. However, under the conditions of our country, fertilizer is also used in the area of perennial plants. In this context, while the total cultivated agricultural area in 2022 is 20,170,000 hectares according to FAO criteria, it is considered as 23,845,000 hectares under Turkish conditions.

The amount of chemical fertilizer used as pure plant nutrients (N, P_2O_5, K_2O) in Turkiye as of the end of 2022 was 2,313,689 tons, a decrease of 10.15% compared to 2021. The amount of chemical fertilizer use as pure plant nutrients per hectare of total cultivated agricultural land in Turkiye is 97 kg by the end of 2022. Excess fertilizer use does not occur in dry agricultural areas, but in some local and irrigated areas[113].

According to FAO 2020 data, the average fertilizer use per hectare of arable land on the basis of plant nutrients was 157 kg/ha in European Union countries, 145 kg/ha in the world and 150 kg/ha in Turkiye[114].

The target in fertilizer use is to ensure that farmers use fertilizers at the right time, in the appropriate way and in the appropriate amount based on soil analysis, to avoid practices that will lead to water pollution and degrade the structure of the soil and reduce its fertility, to expand organic agriculture and to practice sustainable agriculture. In order to increase the efficiency of fertilizer use, it is important to expand the use of organic and organomineral fertilizers in addition to chemical fertilizers[115].

Graph 150- TOTAL CHEMICAL FERTILIZER CONSUMPTION BASED ON PLANT NUTRIENT MATERIAL BY YEAR (thousand tons)
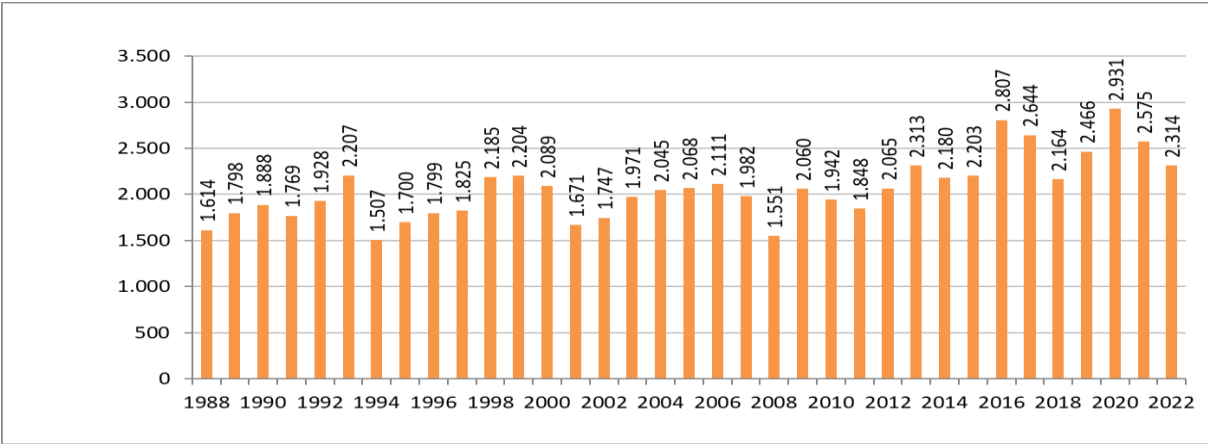
Source: Ministry of Agriculture and Forestry, 2023

13.3- Use Of Pesticides

The indicator is a pressure indicator. The total amount of pesticide use in Turkiye in 2022 increased by 4.5% compared to 2021 and reached 55,374 tons. When the amount of pesticide use is analyzed by groups, fungicides (fungicides) constitute the largest group in Turkiye as in the world. In 2022, fungicides accounted for 35.1% of total pesticide use, herbicides (weed killers) 26.3%, insecticides (insect killers) 22.0%, acaricides (mite killers) 4.5%, 0.5% rodenticides (rodenticides) and 11.6% others (plant activators, plant growth regulators, insect attractants, fumigants, nematocides, sulfur, mineral oils).

As of 2022, the top 5 provinces with the highest pesticide use were Antalya (4,272 tons) with 7.7% of total use, Manisa (4,213 tons) with 7.6%, Mersin (3,985 tons) with 7.2%, Adana (3,276 tons) with 5.9%, and Malatya (2,280 tons) with 4.1%.

In order to prevent the misuse of pesticides, the Ministry of Agriculture and Forestry continues to carry out awareness raising activities such as the dissemination of Integrated Control activities, which are accepted all over the world in the fight against harmful organisms in plant products, conducting pre-harvest pesticide inspections, including biological and biotechnical control methods among alternative control methods within the scope of support and making them widespread, and focusing on distance education extension activities together with widespread and practical trainings such as farmer field schools[116].

Graph 151- TOTAL AGRICULTURAL PESTICIDE USE BY YEARS
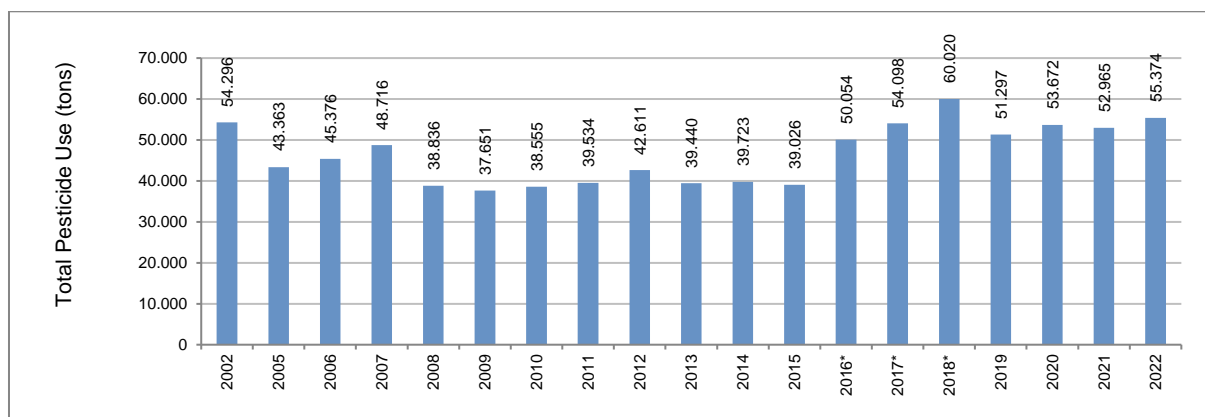
(*) After 2016, the amount of utilization seems high due to the change in the calculation method.

13.4- Organic Farming Lands And Production Amounts

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Organic farming is an environmentally friendly farming practice, and the area under organic farming and the amount of production is a response indicator. Organic farming refers to the controlled and certified, traceable production system carried out in accordance with the principles of organic farming activities specified in the Organic Agriculture Law No. 5262 and the By- Law on the Principles and Implementation of Organic Agriculture issued based on this Law. In our country, the number of organic products increased from 150 in 2002 to 268 in 2022, the number of farmers from 12.428 to 44.927, the total production area from 89.827 ha to 310.584 ha, and the production amount from 310.125 tons to 1.600.858 tons.

According to 2022 data, organic agriculture has a share of 1.5% of the total agricultural area in Turkiye. According to 2021 data, organic agriculture is practiced in 1.6% of the total agricultural area worldwide[117]. In European Union countries, organic agriculture is practiced in 9.6% of the total agricultural area[118].

In 2022, a total of 101 producers realized organic animal production with 7,220 cattle, 5,330 ovine and 684,408 poultry. In addition, organic beekeeping is practiced by 591 producers with 95,733 hives.

Graph 152- RATIO OF ORGANIC AGRICULTURAL AREAS IN TOTAL AGRICULTURAL AREAS (%)
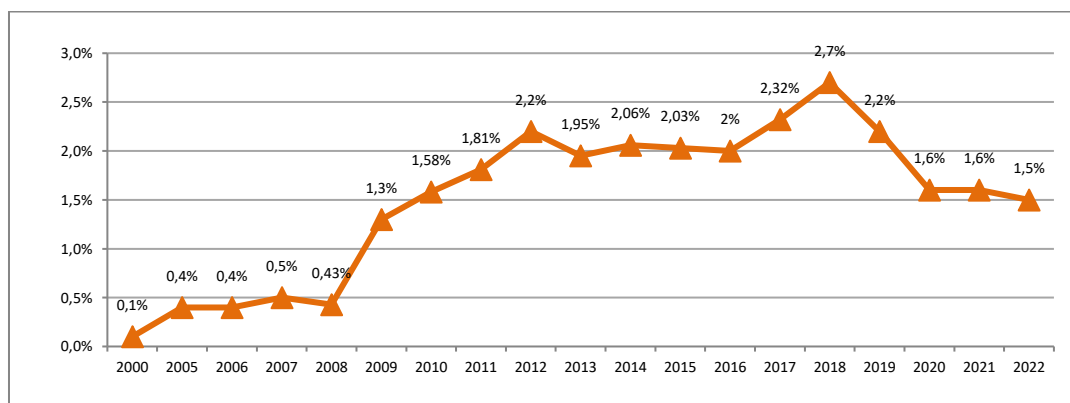
Notes: (1) Transition data are included. (2) Production areas include natural collection areas.

Graph 153- ORGANIC LIVESTOCK DATA
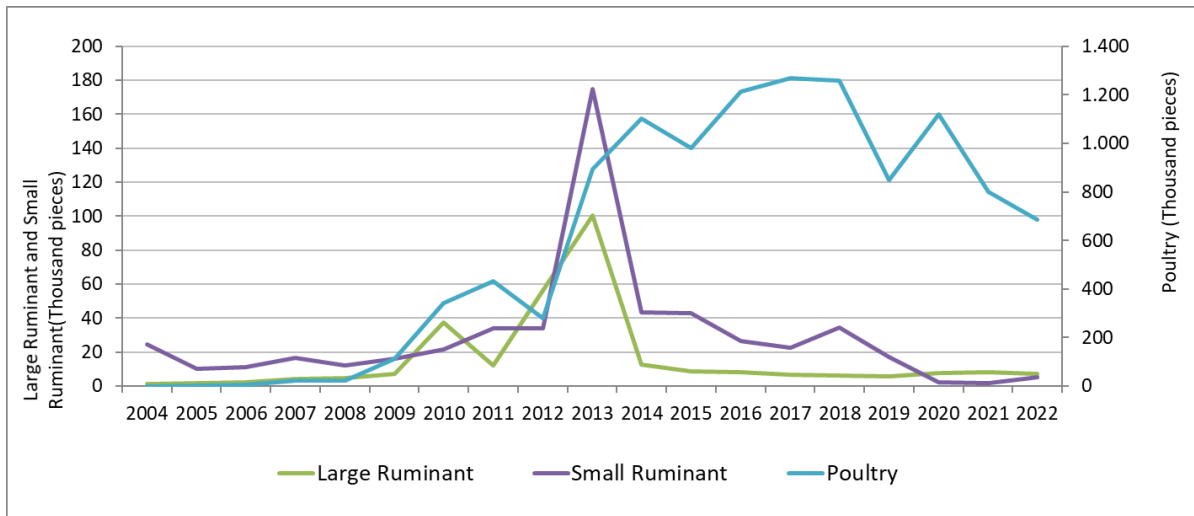
Sources: Ministry of Agriculture and Forestry, 2023

13.5- Good Agricultural Practices

Ⓘ Ⓑ Ⓓ Ⓔ **Ⓡ**

Good agricultural practices are an agricultural production that does not harm the environment, human and animal health, and a livable nature and unpolluted natural resources are the greatest social gain. The area of good agricultural practices and the amount of production are indicators in this field. In this respect, the indicator is a reaction indicator.

In Turkiye, the amount of production of good agricultural practices in 2007 was 56,000 tons on 5,360 ha with 651 producers, and in 2022 it will be 5,336,252 tons on 206,893 ha with 9,570 producers.

The area of good agricultural practices within the total agricultural area in Turkiye has a share of 1% with the data of 2022. In 2022, the number of cattle in good agricultural practices was 39,343, the number of poultry was 279,924,045, and aquaculture products were 23,450 tons/year[119].

Graph 154- AREA AND AMOUNT OF GOOD AGRICULTURAL PRACTICES PRODUCTION BY YEARS
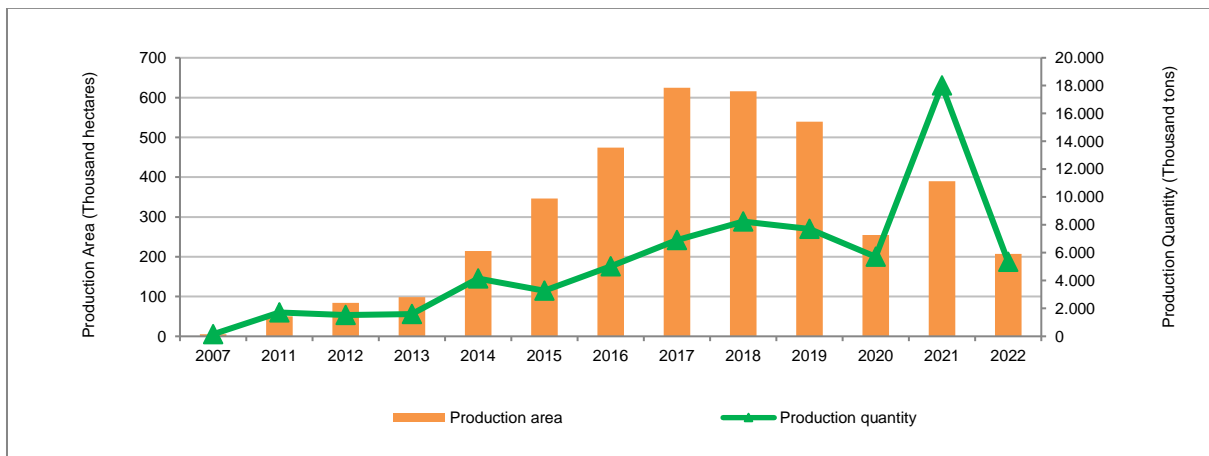
Sources: Ministry of Agriculture and Forestry, 2023

14

FISHERIES

14.1- Aquaculture Production

The indicator is a pressure indicator. Turkiye has a total of 24 million ha of marine area and 1.5 million ha of inland water area. According to TURKSTAT data; fishery production increased by 6.2% in 2022 compared to 2021 and reached 849,808 tons. Sea fish obtained by hunting accounted for 30% of the production, other sea products obtained by hunting accounted for 5.6%, inland water products obtained by hunting accounted for 3.9% and fishery products accounted for 60.6%.

In 2022, compared to the previous year, seafood catch in marine and inland waters increased by 2.7% and fishery production increased by 9.1%. While hunting production was 335,003 tons, fishery production was 514,805 tons. Of the fishery production, 28.4% was realized in inland waters and 71.6% in the seas.

The Western Black Sea Region ranked first in seafood production with 39.2%. This region was followed by the Eastern Black Sea Region with 34.2%, the Aegean Region with 14.2%, the Marmara Region with 8% and the Mediterranean Region with 4.3%[120].

In order to ensure the protection and sustainable operation of fishery resources, Laws are made regarding the place, time, length, species, distance, depth and fishing gear and equipment. In addition, various studies are carried out to monitor fish stocks and protect endangered species, to reinforce stocks through fisheries, to monitor water resources in terms of pollution and to take preventive measures.

Graph 155- AQUACULTURE PRODUCTION DATA BY YEARS (2002-2022)
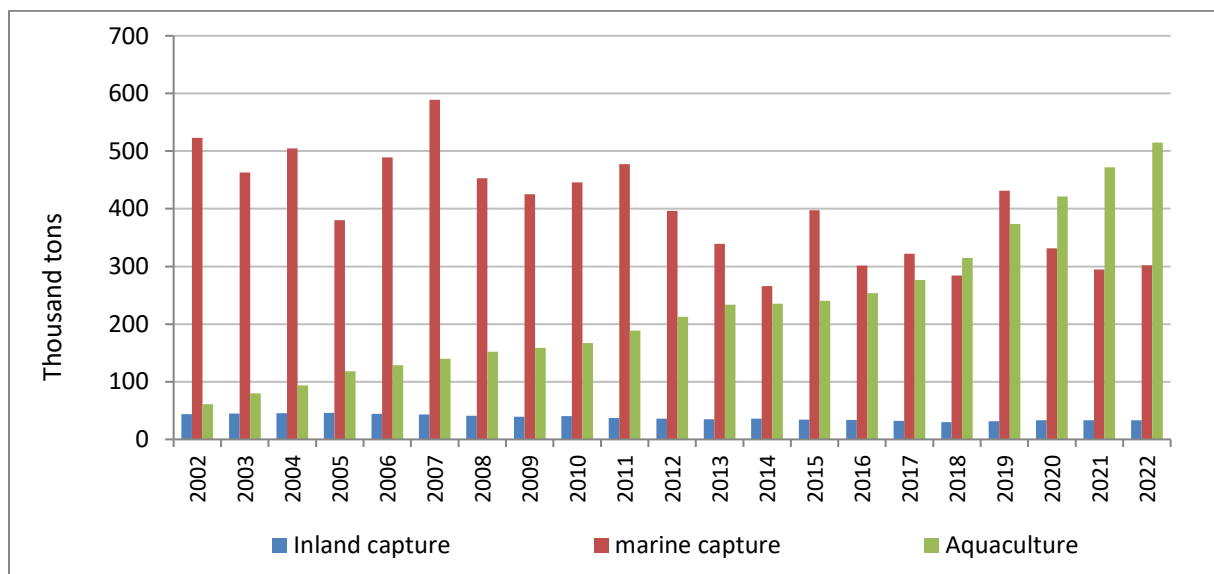
Source: Ministry of Agriculture and Forestry, TURKSTAT, "Aquaculture News Bulletin, 2022"

14.2- Fishing Fleet Capacity

The indicator is a measure of the size and capacity of the fishing fleet, which is assumed to cause pressure on marine fish and the environment. As in the rest of the world, the production of fishery products in Turkiye is at limited levels. For this reason, the main approach accepted by scientists in fishing is to maintain production by protecting stocks. The fishing fleet has grown and developed in terms of power, number, technology and fishing gear until the 2000s. According to TURKSTAT data, while the number of active fishing vessels in our seas was 13.381 in 2000, this number increased to 18.396 in 2005 and decreased to 14.064 in 2022.

In order to protect fisheries resources and ensure the sustainability of our fisheries, no new vessel licenses have been issued since 2002, limiting the further growth of the fleet.

In order to reduce the fishing pressure on the resources by considering the balance between the fisheries stocks and the fishing fleet in our seas, since 2012, fishermen who want to take their vessels out of fishing are given support payments according to the size of the vessel in return for the cancellation of their licenses.

In this context, a total of 1,264 fishing vessels of 10 meters and above were removed from the fleet between 2012-2018. With the effect of this policy, the total number of vessels decreased[121].

Graph 156- NUMBER OF FISHING VESSELS BY YEARS

	2005	2006	2007	2008	2009	2010	2011	2012	2015	2016	2017	2018	2019	2020	2021	2022
Fishing fleet total engine power (Kw)	1.177.76	1.255.61	1.219.10	1.315.91	1.084.08	1.147.87	1.131.94	1.125.23	1.076.18	1.195.03	1.262.46	1.277.85	1.380.85	1.450.14	1.542.56	1.559.38
Number of fishing vessels	18.396	17.823	17.681	17.161	16.845	16.650	14.300	14.324	14.340	14.501	14.479	14.168	14.092	14.243	14.220	14.064

Source: TURKSTAT,2023

146
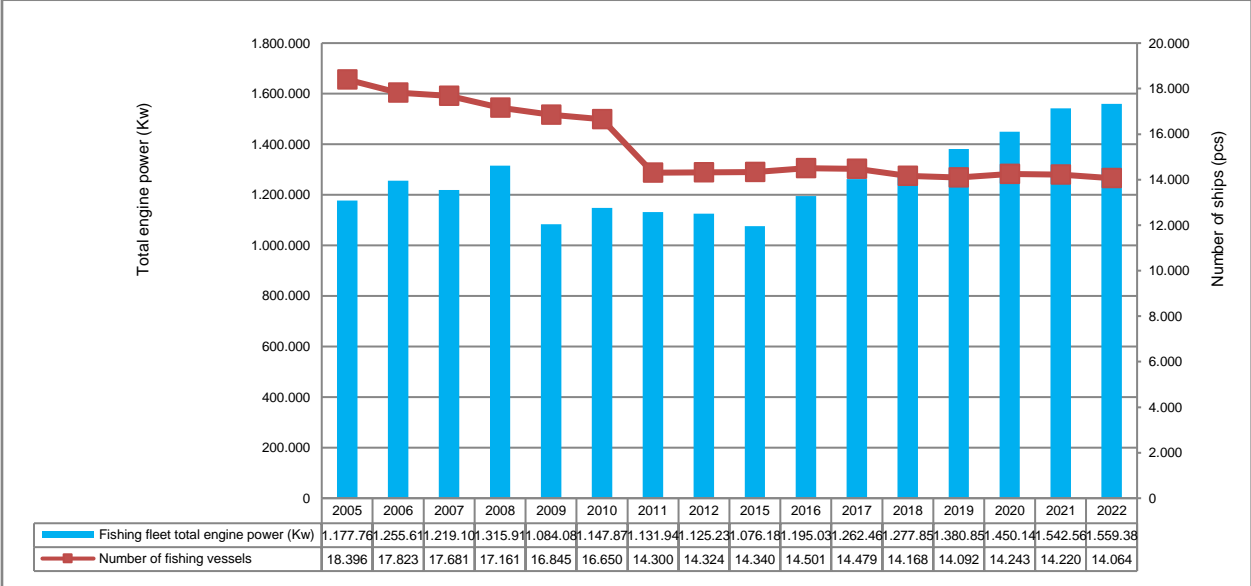
15

TOURISM

15.1- Number of Tourists

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The high number of visitors coming to the country in a certain period puts pressure on the environment due to excessive consumption of natural resources in certain periods of the year, wastewater, waste production, noise, etc.

The number of tourists is calculated by subtracting the number of day-trippers from the sum of the number of foreign visitors to Turkiye and the number of citizens residing abroad.

The number of tourists in Turkiye, which was 15,774,505 in 2003, was 51,191,882 in 2019. In 2019, the number of tourists increased by 11.85% compared to 2018.

However, due to the Covid-19 pandemic that affected the whole world, the number of tourists in 2020 was 15,893,967 and there was a 68.95% decrease in the number of tourists in 2020 compared to 2019. In 2021, the decrease in the impact of Covid-19 and the normalization of life brought a noticeable increase in tourism movements, and the number of tourists increased by 88.28% in 2021 compared to 2020 and reached 29,925,441. In 2022, this increase continued and the number of tourists increased by 68.60% compared to 2021 and reached 50,452,799 in 2022.

Graph 157-TOURIST ARRIVALS FOR THE PERIOD 2003-2022
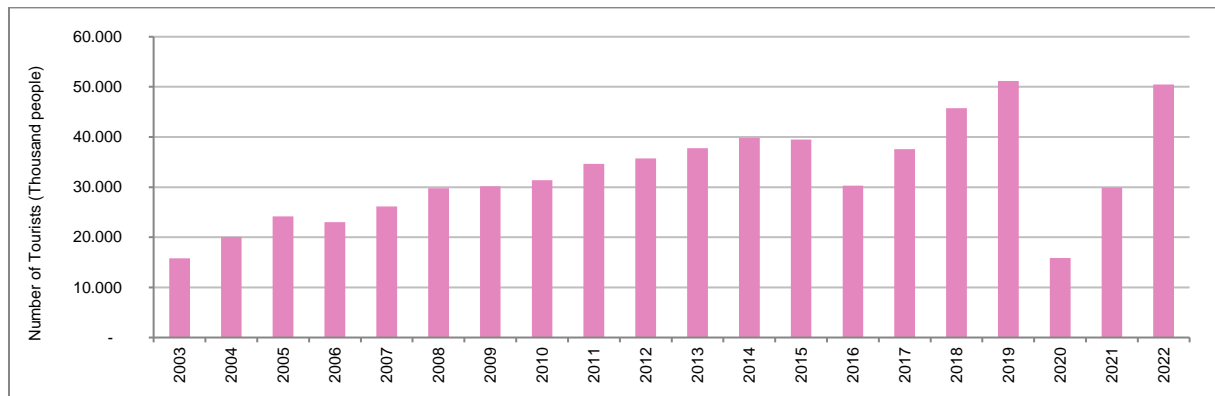
Source: TURKSTAT, Ministry of Culture and Tourism, 2023

Looking at the distribution of the number of tourists by months, it is seen that most tourists come to Turkiye in the summer months. The fact that per capita water consumption in touristic facilities exceeds the standards and that this consumption occurs in the summer period when water resources are at their lowest, causes environmental problems related to water. Excessive water withdrawal from deep water wells also has the risk of increasing the water problem.

Graph 158- MONTHLY DISTRIBUTION OF TOURISTS VISITING TURKEY TÜRKİYE IN 2022
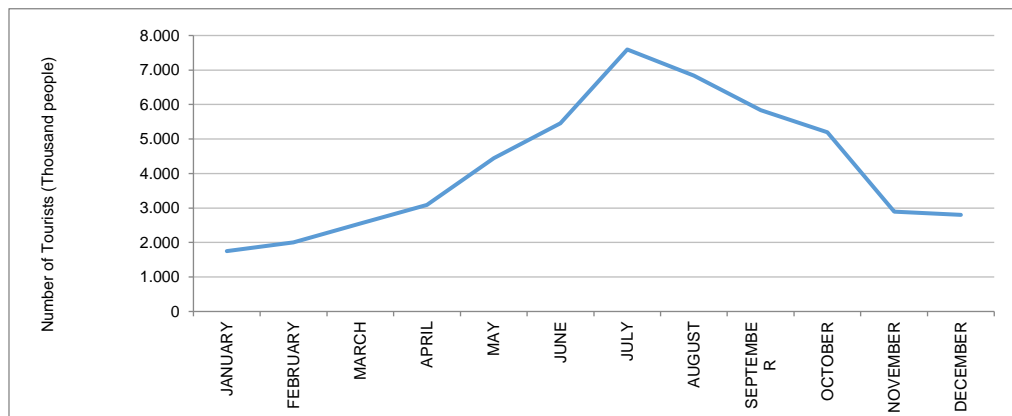
Source: Ministry of Culture and Tourism, 2023

15.2- Number of Environmentally Friendly Accommodation Facilities

The indicator is a reaction indicator. In order to protect the environment, raise environmental awareness, encourage and incentivize the positive contribution of touristic facilities to the environment, the Ministry of Culture and Tourism awards "Environmentally Friendly Accommodation Facility Certificate" and plaque to accommodation facilities with "Tourism Facility Certificate" that operate in an environmentally friendly manner.

As of the end of 2022, the number of accommodation facilities with Tourism Facility Certificates was 4,830 and 441 of these facilities (9.13%) were certified with an environmentally friendly accommodation facility certificate (green star)[122].

Graph 159- NUMBER OF GREEN STAR CERTIFIED FACILITIES BY YEARS
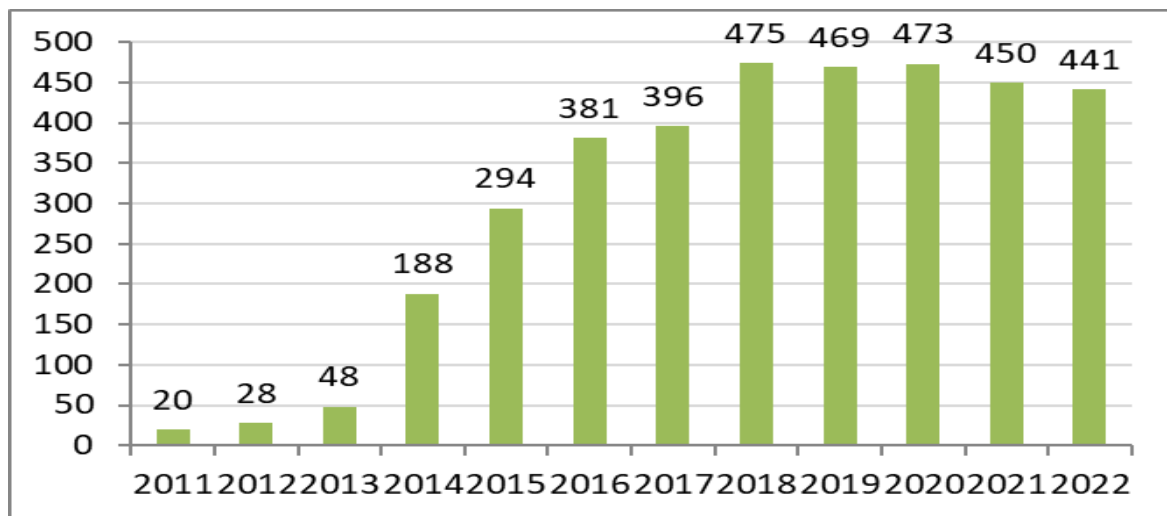
Source: Ministry of Culture and Tourism, 2023

15.3- Number of Tourist Overnight Stays and Number of Beds per 1000 Inhabitants

The indicator is based on the total number of overnight stays in touristic facilities and the ratio of the number of beds in tourism certified facilities to the total population per 1000 inhabitants. It is a pressure indicator.

Increasing number of tourists may have negative impacts on the environment. Excessive consumption of resources in that region at certain times of the year (water use and waste generation) can lead to serious environmental problems.

The number of beds in certified tourism facilities per 1000 inhabitants in Turkiye has increased steadily over the years. The number of tourist overnight stays per 1000 inhabitants has fluctuated up and down. As of 2022, the number of beds per 1000 inhabitants in Turkiye was 12.77 and the number of overnight stays was 2179.91[123].

Graph 160- NUMBER OF TOURIST OVERNIGHT STAYS AND BEDS PER THOUSAND INHABITANTS

	1990	2000	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
"Number of overnight stays per 1000 people"	357	577	1116	1087	1143	1331	1425	1602	1600	1674	1700	1410	1438	1761	1914	775	1460,22	2179,91
Number of beds per 1000 people	3,07	4,80	7,54	7,93	8,39	8,54	8,95	9,34	9,77	10,39	10,78	11,27	11,57	11,88	11,93	12,21	12,583	12,7729
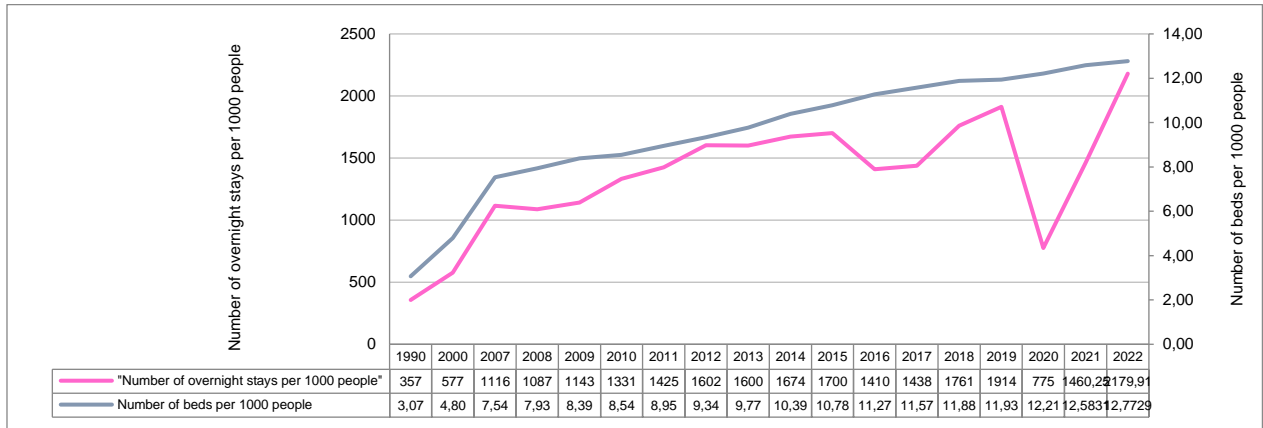
Note: In the comparison of the number of overnight stays in facilities over the years; the factor of continuous change in the number of facilities and beds should be taken into consideration.
Sources: Ministry of Culture and Tourism data on overnight stays and number of beds, TURKSTAT data on population

15.4- Blue Flag Applications

Ⓘ Ⓑ **Ⓢ** Ⓔ Ⓣ

The indicator is a status indicator. The Blue Flag is an international environmental award given to qualified beaches, marinas, yachts and tourism boats that meet the required standards. Launched in 1987 in the European Union and in 1993 in Turkiye, Blue Flag practices aim to establish high standards for beaches, marinas, yachts and tourism boats.

Between 1994 and 2022, the number of Blue Flags in Turkiye increased steadily and in 2022, 531 beaches, 24 marinas, 5 yachts and 15 tourism boats were awarded with Blue Flags.

Within the scope of the Blue Flag Program carried out under the coordination of the Turkish Environmental Education Foundation (TÜRÇEV) in our country, in 2023, our country ranked third with 551 beaches after Spain's 629 beaches and Greece's 617 beaches. In marinas, it ranked seventh in the world.

Graph 161- NUMBER OF BLUE FLAG BEACHES and MARINAS IN TURKIYE BY YEAR
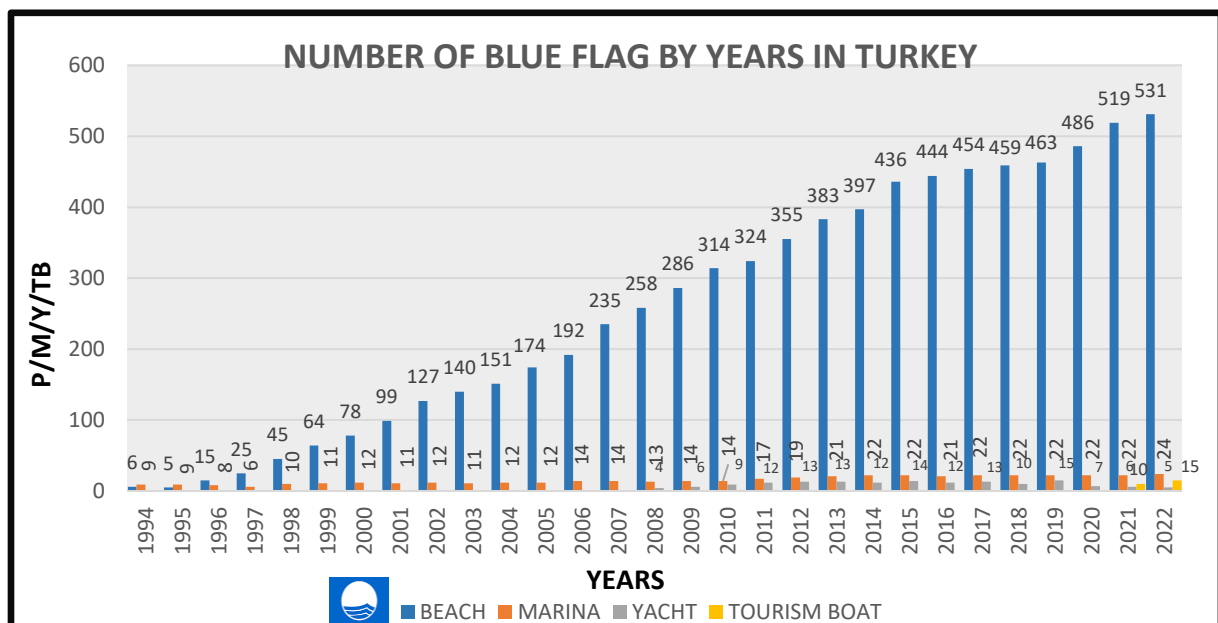
Source: Ministry of Culture and Tourism, 2023

15.5- Green Key Applications

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The Green Key is an international environmental award that recognizes and supports initiatives to protect the environment and contribute to climate change prevention and sustainable tourism. By meeting a set of high standard environmental requirements, properties awarded with the Green Key express their commitment to helping make a difference at an environmental and sustainability level.

The Green Key, a prestigious eco-label, applies to six different categories of tourism businesses (hotels and hostels, small accommodations, campsites, conference centers, restaurants and tourist attractions).

The program, which was first implemented in Denmark in 1994, started to be implemented as the fifth program of the International Foundation for Environmental Education (FEE) in 2002. Within the scope of this program, which is implemented in 60 countries internationally, there are more than 3600 Green Key Awarded Facilities in total. In our country, the Green Key Program, which has been carried out by the Turkish Environmental Education Foundation (TÜRÇEV) since 2011, ranked tenth with 116 facilities in 2022[124].

Graph 162- NUMBER OF GREEN KEY FACILITIES IN TURKIYE BY YEAR
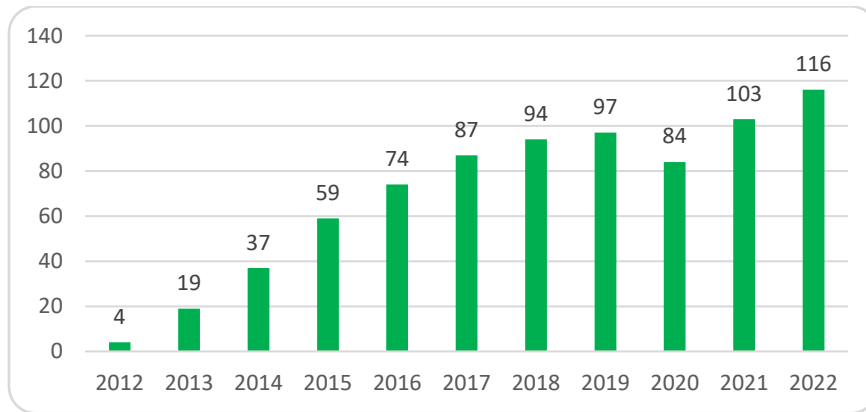
Source: Turkish Environmental Education Foundation, 2023

15.6- Number of Overnight Stays in Tourism Operation Certified Facilities by Province

P

The indicator is a pressure indicator. The indicator of the number of overnight stays by province in accommodation facilities with tourism management certificates expresses overnight stay figures on the basis of 81 provinces. An overnight stay is defined as each night a customer spends in an accommodation facility by registering for a check-in.

While in 2013, the total number of overnight stays in accommodation facilities with Ministry operating certificate was 122.6 million, this number increased by 51.5% to 185.9 million overnight stays in 2022, with 62.6 million domestic and 123.3 million foreigners.

In 2022, the top 7 provinces in terms of the number of overnight stays in facilities with tourism management certificates are Antalya (58%), Istanbul (20%), Muğla (8%), Izmir (5%), Aydın (4%), Ankara (3%) and Bursa (%2)[125].

Table 39- TOURISM CERTIFIED ACCOMMODATION STATISTICS

TOURISM CERTIFIED ACCOMMODATION STATISTICS			
YEAR	**Overnight Domestic**	**Overnight Foreign**	**Overnight Total**
2013	33 090 923	89 591 559	122 682 482
2014	32 448 842	97 581 075	130 029 917
2015	37 480 990	96 400 316	133 881 306
2016	46 752 171	65 793 307	112 545 478
2017	47 305 826	68 921 870	116 227 696
2018	49 305 889	95 109 378	144 415 267
2019	46 970 422	112 178 562	159 148 984
2020	31 518 111	33 286 311	64 804 422
2021	48 133 008	75 521 703	123 654 711
2022	62 593 776	123 308 334	185 902 110

Graph 163- TOURISM FACILITY CERTIFIED ACCOMMODATION STATISTICS 2013-2022
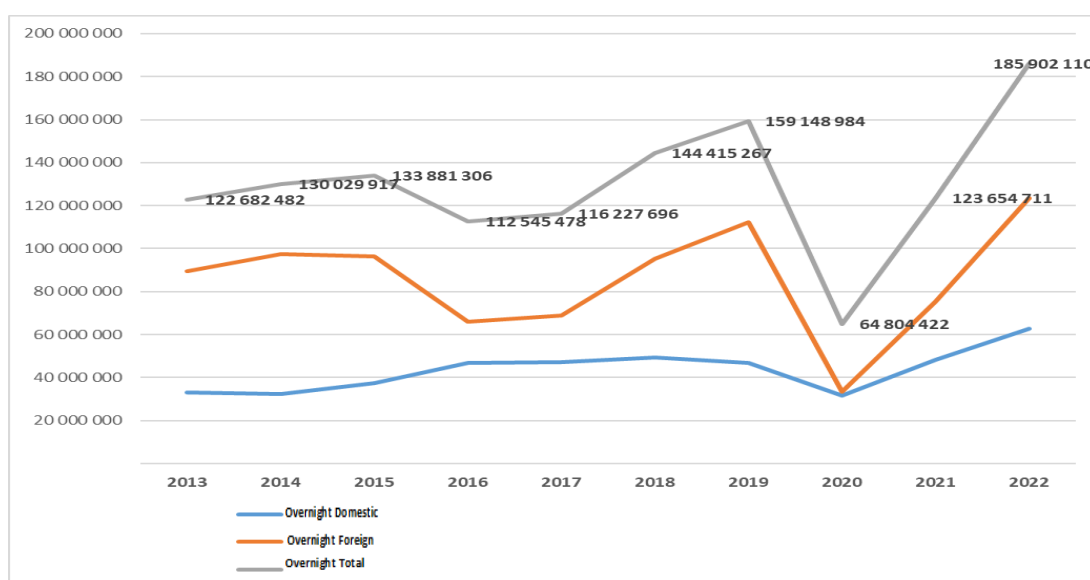
Source: Ministry of Culture and Tourism, Accommodation Statistics 2022

Graph 164-2022 NUMBER OF OVERNIGHT STAYS IN FACILITIES WITH TOURISM FACILITY CERTIFICATE

Source: Ministry of Culture and Tourism, Accommodation Statistics 2022

153
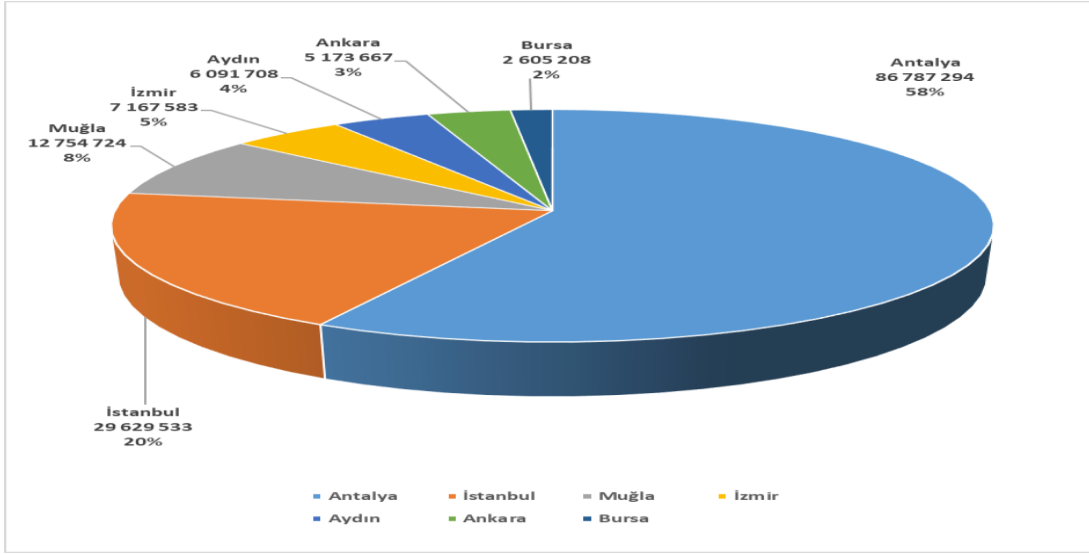
16
DISASTERS

16.1- Forest Fires

I B D **I** T
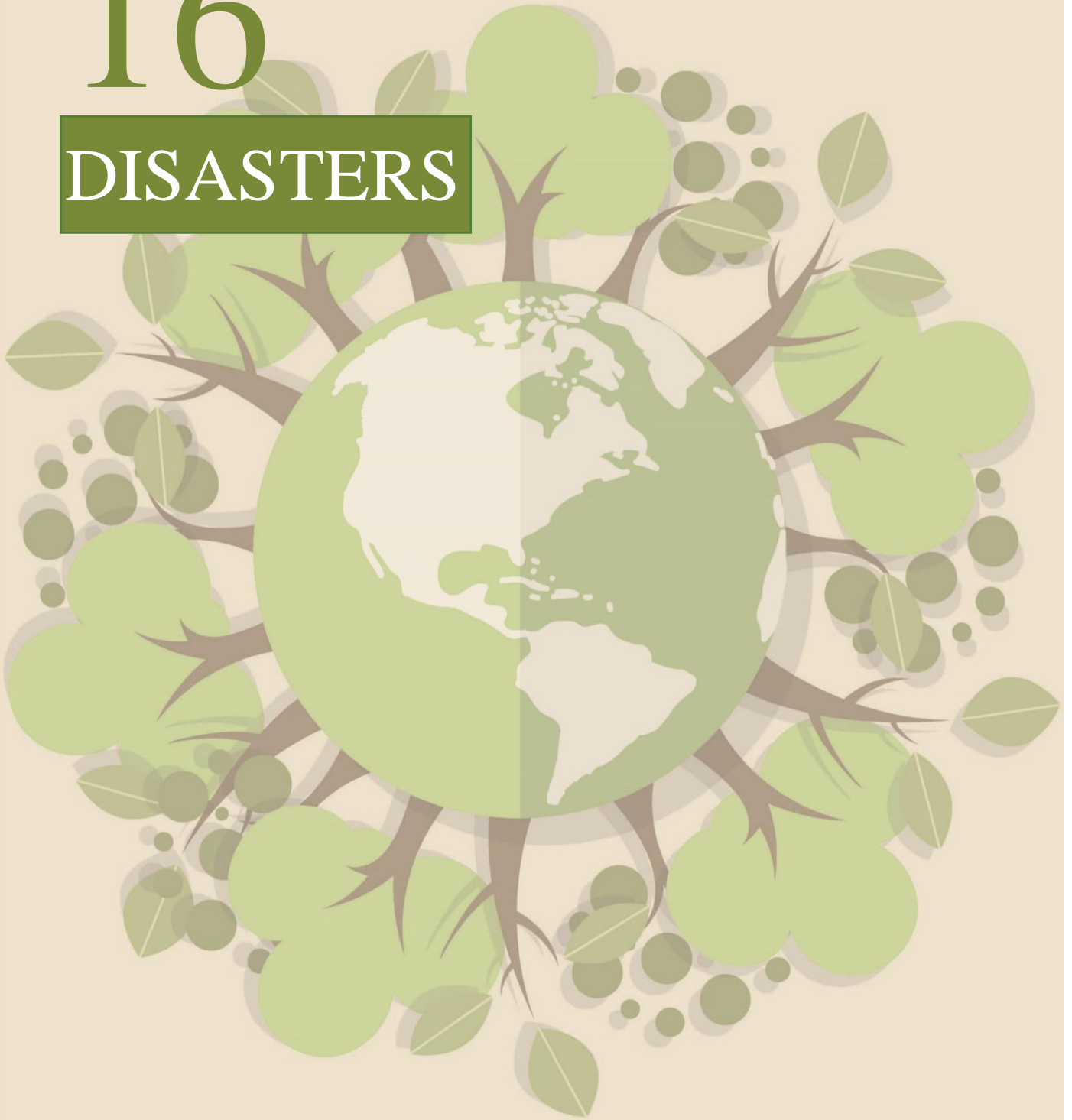
The indicator is an impact indicator. Most of Turkiye's forests, which are located in the Mediterranean climate zone, are under fire threat.

In 2022, 2,160 forest fires broke out and 12,799 hectares of forest area was damaged in these fires. The average area burned per fire was 5.9 hectares. In 2022, there was a 29.30% decrease in the number of fires compared to the previous year. The area of forest burned decreased by 989.95% compared to the previous year.

The vast majority of fires in our forests are started by humans. In 2022, the cause of 41.12% of forest fires could not be determined. 31.48% of forest fires were caused by negligence-carelessness, 6.94% by accident, 3.98% by intent, and 16.48% by lightning strikes[126].

According to the European Forest Fire Information System (EFFIS) data, the 10-year (2012-2022) average amount of area burned per fire in European countries in the Mediterranean climate zone was 28.44 thousand ha in Greece, 65.6 thousand ha in Italy, 102.2 thousand ha in Spain, 134.7 thousand ha in Portugal, 22.9 thousand ha in Turkiye and 19.5 thousand ha in France[127].

Graph 165- FOREST FIRES (1990-2022)
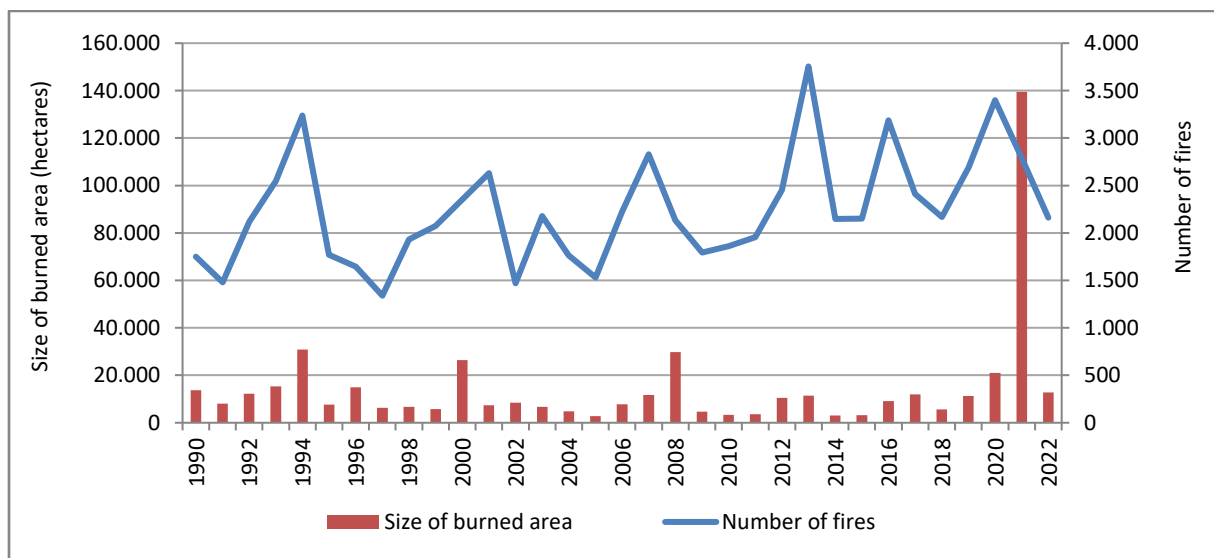
Graph 166- NUMBER OF FIRES ACCORDING TO THEIR CAUSES (1997-2022)
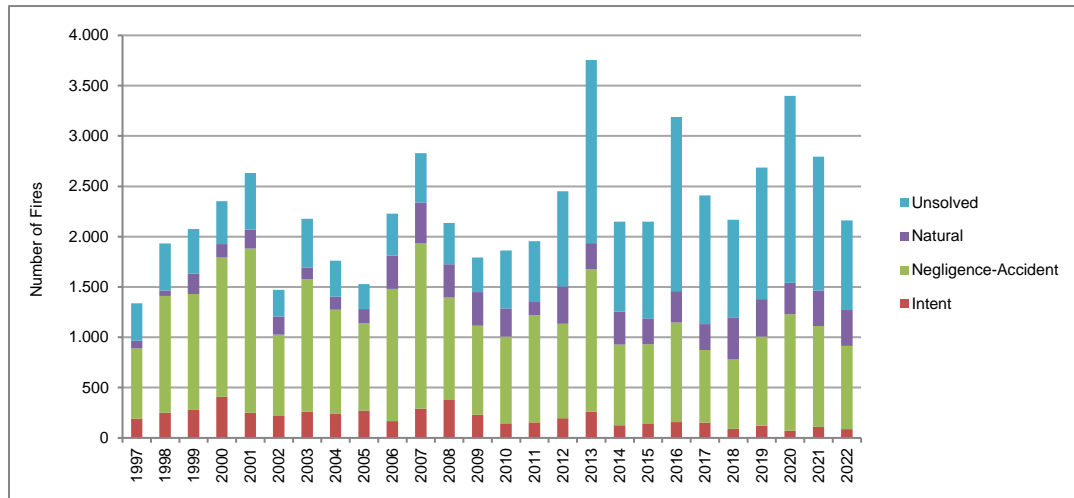
Source: Ministry of Agriculture and Forestry, General Directorate of Forestry, Forest Statistics 2022, https://www.ogm.gov.tr/ ekutuphane/Sayfalar/Istatistikler.aspx

16.2- Disasters by Type

Natural disasters are impact indicators and technological accidents are pressure indicators. According to Turkiye Disaster Information Bank (TABB) data, a total of 27,049 disasters (excluding road/vehicle accidents) occurred between 1990-2018. Among these, it is seen that other disasters come first with 8114 disasters. This was followed by landslides with 7616 and earthquakes (earthquakes causing damage) with 1871.

A total of 27,119 people lost their lives in disasters (excluding road/vehicle accidents) in Turkiye between 1990-2018. The highest number of deaths was in earthquakes (earthquakes causing damage) with 24,348 people[128].

Graph 167- NUMBER OF DISASTERS IN TURKIYE BY THEIR TYPES AND DEATH TOLL BETWEEN 1990 AND 2018 ACCORDING TO TURKIYE DISASTER INFORMATION BANK (TABB) DATA

	Fire/ Urban Fire	Terrorist Incidents	Landslide	Explosion	Storm/Typ hoon	Extreme winter conditions	Flood	Avalanche	Damaging Earthquak es	Other
Number of Occurrences	2705	441	7616	570	1733	843	1839	1317	1871	8114
Number of the Death	79	202	28	261	202	143	221	117	24348	1518
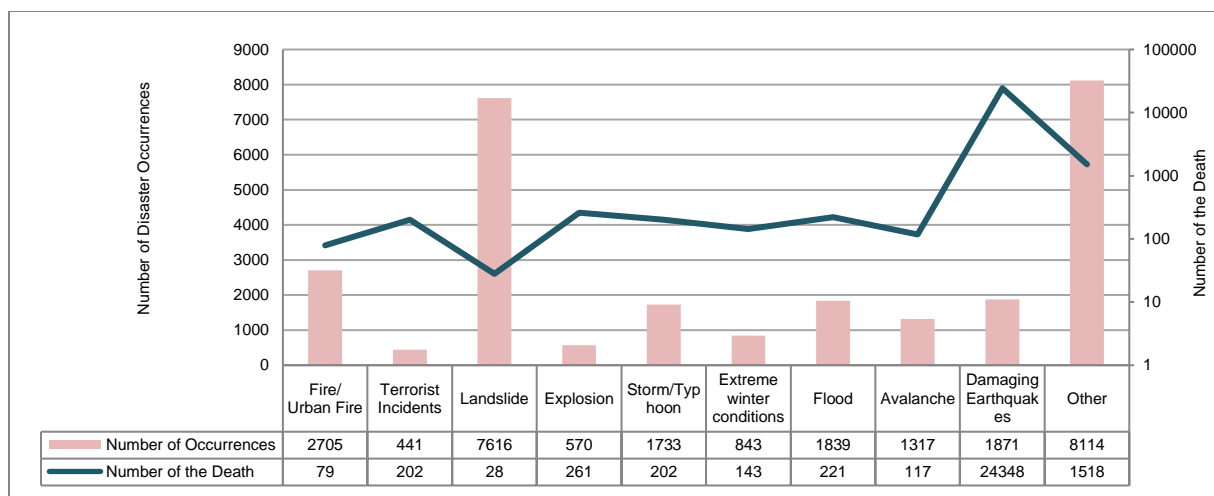
Sources: https://tabb-analiz.afad.gov.tr/Genel/Raporlar.aspx
Note Excluding road/vehicle accidents.

Data on disasters and accidents between 2020-2021 in the Intervention Reports section of AYDES (Disaster Management Decision Support System) are given in the table below.

Table 40- AYDES RESPONSE REPORTS 2020-2021 DISASTER AND ACCIDENT DATA

Incident type	Number of incidents	
	2020	2021
Extreme Snow Blizzard	5	12
Dam Burst	3	2
Biological accident	100	12
Drowning	250	222
Mud Flow	2	1
Avalanche	16	5
Railway Accidents	4	2
Maritime Accidents	1	3
Earthquake	74	417
Other Road and Transportation Accidents	2	1
Industrial Accidents	4	4
Storm	21	40
Landslide	26	31
Rockfall	10	8
Coastal Flooding	-	1
Chemical Accident	380	312
Sandstorm	1	-
Mine Accident	9	14
Cave or Karstic Cavity Collapse	4	4
Rubble Flow	1	3
Forest Fire	134	93
Radiological or Nuclear Accident	9	7
Flooding	225	416
Fire	103	201
Structural Collapse Collapse	84	96
Lightning	-	1

16.3- Number of Risk Assessment and Emergency Response Plans

Coastal facilities performing activities that may cause pollution of the seas with oil and other harmful substances are obliged to prepare a risk assessment and emergency response plan and submit it to the approval of the Ministry of Environment, Urbanization and Climate Change within the scope of the "Law No. 5312 on the Principles of Emergency Response and Compensation of Damages in the Pollution of the Marine Environment with Oil and Other Harmful Substances" and Implementing Law in order to be prepared for accidents caused by ships and coastal facilities.

In this context, risk assessment and emergency response plans of 366 coastal facilities have been approved by the Ministry of Environment and Urbanization and this number corresponds to 99% of all coastal facilities in our country as of 2020. One National and six Regional Emergency Response Plans were prepared by the Ministry of Environment and Urbanization and entered into force on 08.02.2012. Efforts to keep the plans up to date are carried out every year. Risk assessment and emergency response plans for coastal facilities are prepared as sub-elements of national and regional plans.
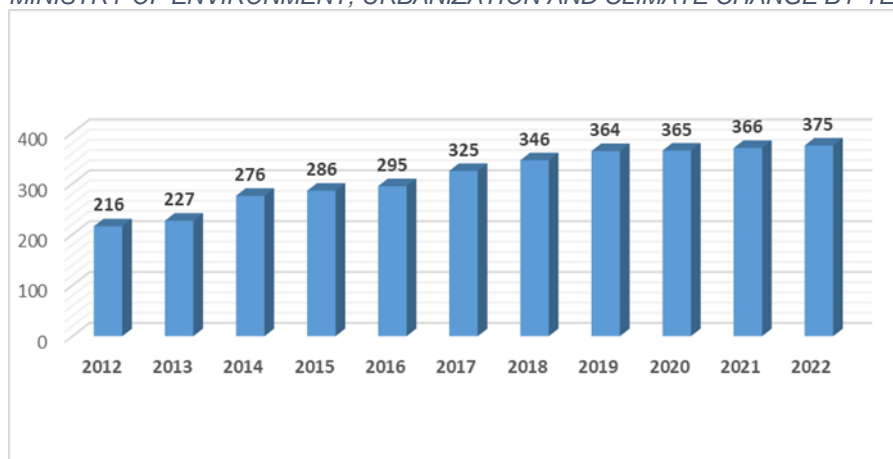
Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Environmental Management, 2023

16.4- Liability Insurances within the Scope of Environmental Legislation

I D T E R

The indicator is a reaction indicator. The concept of risk brings with it the concept of insurance, which requires the risk to be secured. In this sense, environmental liability insurance is currently used as a tool in the management of environmental risks.

Within the scope of environmental legislation; General Terms and Conditions of Compulsory Financial Liability Insurance for Marine Pollution of Coastal Facilities entered into force on July 01, 2007; General Terms and Conditions of Compulsory Financial Liability Insurance for Hazardous Substances and Hazardous Waste entered into force on March 11, 2010; and General Terms and Conditions of Financial Liability Insurance for Environmental Pollution entered into force on September 01, 2011.

With the Coastal Facilities Marine Pollution Compulsory Financial Liability Insurance, certain material and bodily damages caused by marine pollution from coastal facilities are compensated within the coverage limits set by the State. Premium production for this insurance amounted to TL 14,402,298 in 2022.

Environmental Pollution Liability Insurance provides coverage for damages that may be caused by businesses polluting the soil, water or air. Premium production for this insurance amounted to TL 19,629,566 in 2022.

Compulsory Financial Liability Insurance for Hazardous Substances and Hazardous Wastes compensates for bodily and material damages that may be caused by professional activities related to hazardous substances. Premium production for this insurance amounted to TL 121,754,643 in 2022[129].

Graph 169- COASTAL FACILITIES MARINE POLLUTION LIABILITY INSURANCE

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Bonus Amount (Thousand TL)	439	2.068	2.069	1.956	4.187	4.017	6.497	4.670	5.489	6.764	7.207	8.232	9.366	14.402
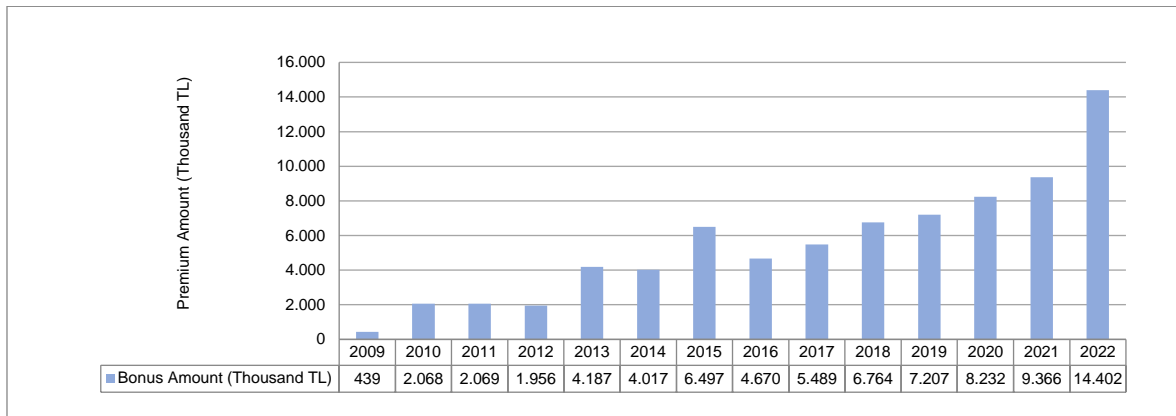
Source: Insurance and Private Pension Law and Supervision Agency, 2023

Graph 170- ENVIRONMENTAL POLLUTION LIABILITY INSURANCE

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Bonus Amount (Thousand TL)	498	1.369	2.500	665	3.275	1.649	4.561	1	113	25	25	2.000	3.316	19.629
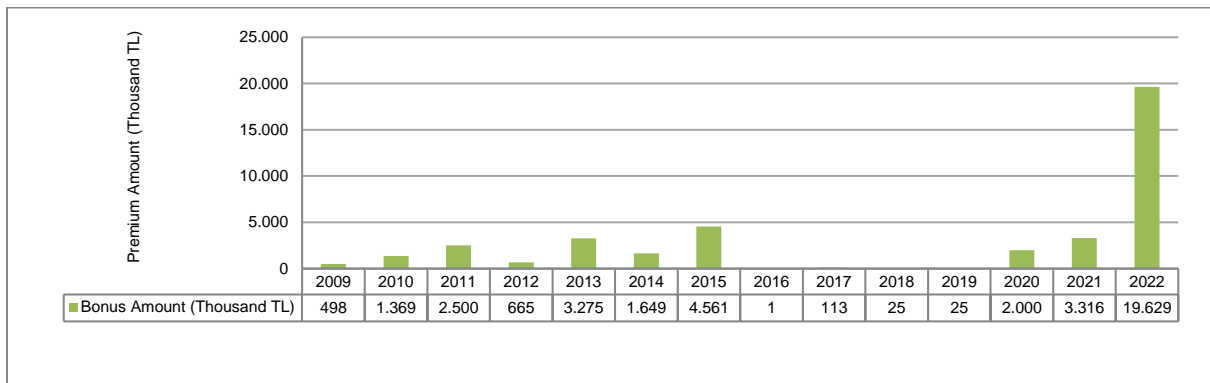
Source: Insurance and Private Pension Law and Supervision Agency, 2023

Graph 171- HAZARDOUS SUBSTANCES AND HAZARDOUS WASTE COMPULSORY LIABILITY INSURANCE

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Bonus Amount (Thousand TL)	11.079	15.509	18.266	20.266	24.291	29.864	37.987	45.135	56.772	63.150	79.265	77.489	83.646	121.75
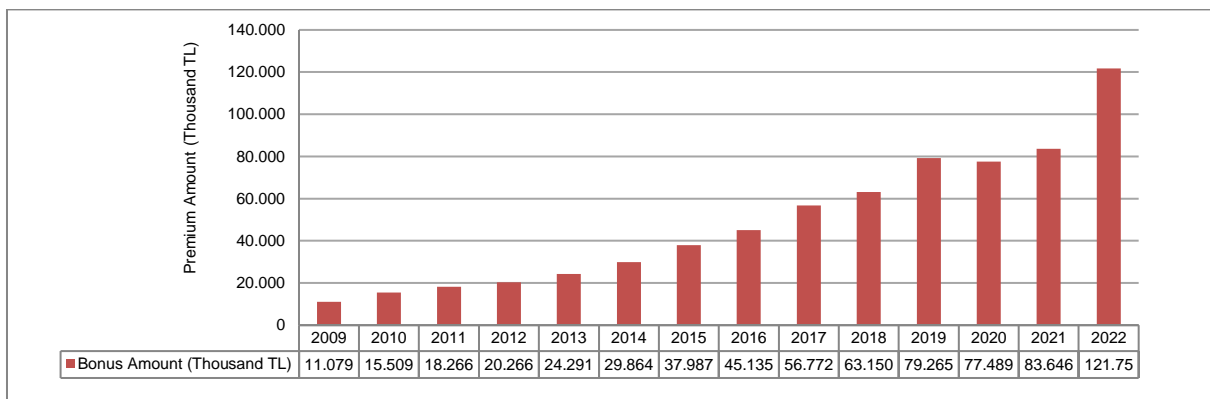
Source: Insurance and Private Pension Law and Supervision Agency, 2023

DEFINITIONS
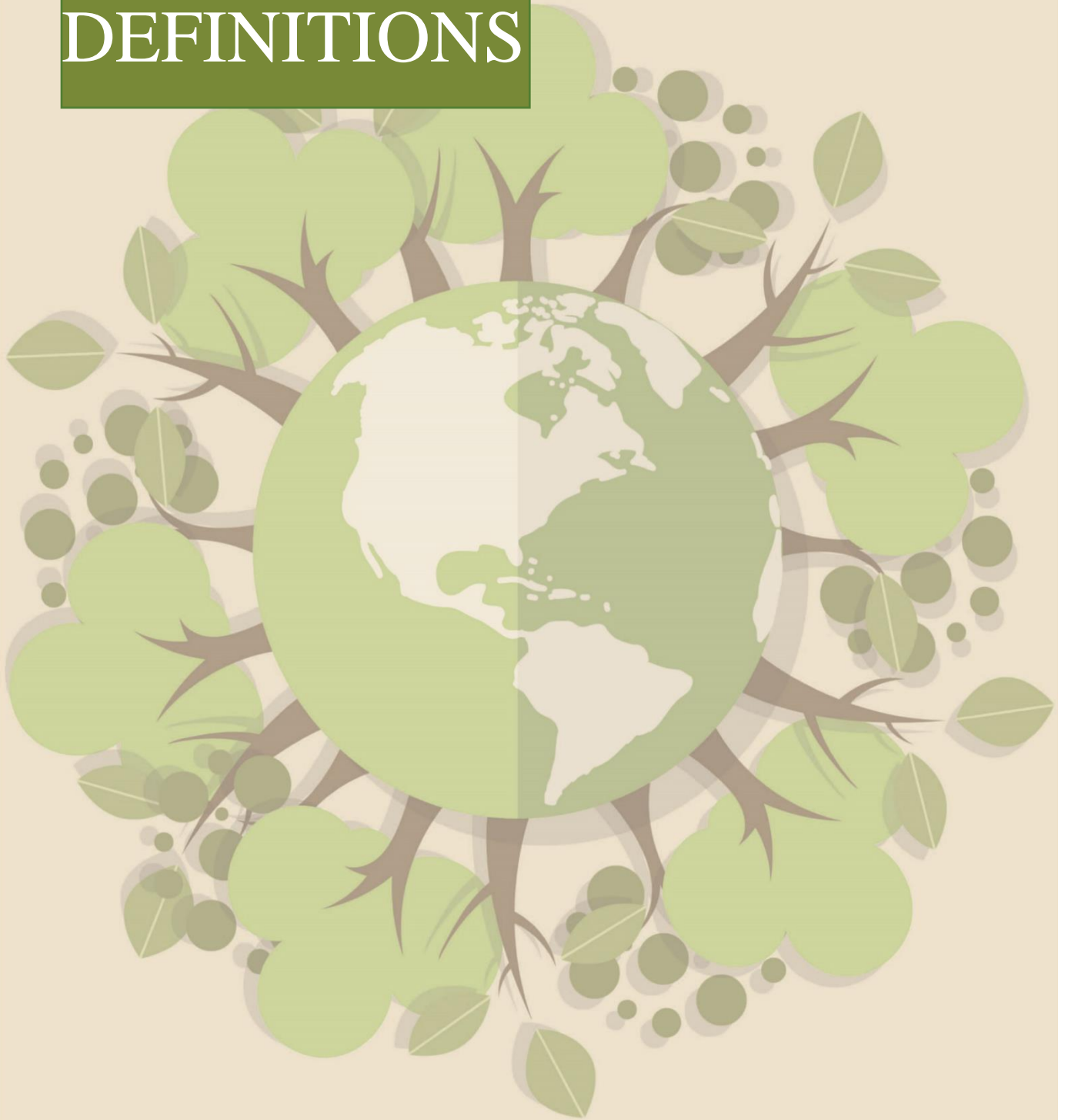
POPULATION

Population Growth Rate

This indicator is the average annual increase in population size in a given period or year. It is expressed as population growth for every 100 inhabitants per year.

Urban Population

Indicates the population within the municipal boundaries of provincial and district centers expressed as a percentage of the total population.

Migrating Population

Changes of permanent residence address in certain areas within the borders of the country within a year are defined as internal migration.

ECONOMY

Resource Efficiency

Resource productivity is the ratio of GDP to domestic consumption of materials. Domestic consumption of materials measures the total amount of materials directly used in the economy. The indicator is calculated by summing the annual amount of raw materials and physical imports extracted from the borders of the economy of interest and subtracting the amount of physical exports. It is emphasized that the term "consumption" used here refers to apparent consumption and not final consumption. The indicator does not include upward flows of imports and exports of raw materials from outside the economy.

Domestic Material Consumption

The Domestic Material Consumption indicator is defined as the total amount of material directly used in the economy. The indicator is equal to Domestic Material Input minus exports. Domestic material input measures materials entering the economy for use. Domestic material input is equal to the sum of domestic material extraction and imports.

Environmental Protection Expenditures

Expenditures for activities aimed at preventing, reducing and eliminating environmental pollution caused by production processes and consumption of goods and services. In the public sector, it also includes expenditure on management, monitoring and regulatory enforcement. Environmental protection covers both pollution prevention and abatement activities and activities related to environmental degradation. The primary objective of activities under this heading is environmental protection. Activities undertaken for other purposes but which also have positive environmental impacts are not included under this heading. Likewise, activities that are undertaken for technical reasons or for internal needs such as hygiene or safety and have environmental benefits are not included

Distribution of Employment by Sector

This indicator indicates the ratio of the active population in each of agriculture, industry, construction and services sectors to the total active population.

HEALTH

Piped Water System (Mains Water)

Bringing pressurized water from the city water network into the house with pipes is considered a piped water system. Pump, well, spring, cistern, rain puddles, fountains outside the house are not considered as piped water system. If the "piped water system" brought into the courtyard in any way is used jointly, the piped water system is considered as "existing".

CLIMATE CHANGE

Greenhouse Gas Emissions

Emissions from energy, industrial processes and product use, agricultural activities and waste disposal include direct greenhouse gases carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs) and sulphur hexafluoride (SF_6), and indirect greenhouse gases nitrogen oxides (Nox), non-methane volatile organic compounds (NMVOCs) and carbon monoxide (CO).

Greenhouse Gas Emissions by Sector

It refers to the amount of greenhouse gas emissions from different sectors in CO_2 equivalent.

Carbon Sink

Natural or man-made systems that store carbon dioxide by absorbing it from the atmosphere. Forests are the most common type of sink. Other sinks include soil, peat, permafrost, ocean water and carbonate deposits in the deep ocean.

Carbon Sequestration

The process of capturing carbon in a way that prevents it from being released into the atmosphere for a certain period of time. The process of removing carbon from the atmosphere and storing it in a repository.

Precipitation

It is the expression of the average amount of rainfall per unit area..

Temperature

Refers to the monitoring of average surface temperatures in time series.

Sea Water Temperature

It refers to the annual change in the time series of seawater surface temperature.

Heating Degree Days [HDD]

It describes the severity of cold at a given time (day, month, year), taking into account outdoor and room temperature. In order to create a comparable and common usage, the Statistical Office of the European Community (Eurostat) recommends the following method for calculating HDD.

HDD = (18 °C - Tm) x value Tm ≤ 15 °C (heating threshold) HDD = 0 if Tm > 15 °C

Here; Tm = Daily average temperature, d= Number of days.

The calculation is done on a daily basis. Monthly and annual day degrees are found by adding them together

Cooling Degree Days [CDD]

Describes the intensity of the temperature, taking into account the outdoor temperature at a given time (day, month, year). Although there is no officially defined threshold temperature, the threshold temperature is taken as 22°C in construction sector energy management practices. Accordingly

CDD = (Tm - 22) x value Tm > 22°C (cooling threshold) CDD = 0 if Tm ≤ 22°C

AIR POLLUTION

Air Pollutant Emissions

Emission of Air Pollutants is the expression in mass (KiloTon, GigaGram, etc.) of the total emission obtained by multiplying activity data and emission factors for certain pollutants annually.

Air Quality

This indicator shows the concentration of SO_2 and PM in the air during Heating Degree Days (HDD). SO_2 is a polluting, suffocating, colorless and acidic gas formed by the release of sulfur compounds naturally present in fuels during combustion. Particulate matter is formed by the chemical transformation and agglomeration of gaseous emissions. Particles with a diameter of 5-10 micrometers are defined as suspended particles. They generally comprise heterogeneous mixtures and their characteristics vary considerably from one location to another. Particulate matter below 10 micrometers in diameter is called PM_{10}.

Limit value: Refers to the level scientifically determined in order to avoid, prevent or reduce harmful effects on the environment and/or human health, to be reached within the stipulated period and not to be exceeded after it is reached.

Large Incineration Plant: Incineration plants using solid, liquid or gaseous fuels with a rated thermal power of 50 MW or more, constructed solely for energy generation.

WATER-WASTEWATER

Water Use

This indicator shows the total amount of water withdrawn from sources on a sectoral basis, including municipal, irrigation, drinking and using, and industry.

Oxygen Consuming Substances in River Waters

The main indicator for the oxygenation status in water bodies is biochemical oxygen demand (BOD), which expresses the oxygen demand of aquatic organisms that consume oxidizable organic matter. This indicator shows the current status and trends regarding ammonia (NH_4) concentrations and BOD in rivers.

Nutrients in Freshwater Resources

The indicator can be used to show geographical variations in current nutrient concentrations - orthophosphate and nitrate concentrations in rivers, total phosphorus and nitrate in lakes, and nitrate in groundwater formations - and temporal trends.

Classification according to trophic state (nutrients); Oligotrophic (low nutrient), mesotrophic (normal, medium nutrient), eutrophic (good nutrient).

Oligotrophic

Limited input of nutrient salts to surface waters, very low organic matter production and biomass concentration.

Mesotrophic

Nitrogen and phosphorus are low. Organic matter and calcium are at normal levels. More biological activity is observed compared to oligotrophy.

Eutrophic

Rich in plant essential nutrients and organic matter. Nitrogen, phosphorus and organic matter are high. Phytoplankton amount is high. High biological activity is observed.

Swimming Water Quality

This indicator shows the quality of bathing water in coastal areas. Within the framework of the Law on the Management of bathing water quality, class A represents the categories of excellent quality, class B good quality, class C adequate quality and class D poor quality.

Municipal Drinking and Potable Water Resources

It expresses the ratios of water withdrawn by municipalities according to the sources of drinking and potable water including dams, wells, natural springs, rivers, lakes and ponds.

Municipalities Served by Wastewater Treatment Plants

This indicator shows the number of municipalities served by wastewater treatment plants and the population benefiting from this service.

Wastewater treatment includes one or more of the physical, chemical and biological processes applied to ensure that wastewater generated as a result of various uses does not change the physical, chemical, bacteriological and ecological characteristics of the receiving environment into which they are discharged.

Wastewater Treatment Plant: Units where foreign substances causing pollution in wastewater are removed from wastewater by various methods (physical, biological, advanced).

Purification Types

- **Physical Purification:** It is a treatment system in which undissolved pollutants in wastewater are separated from the wastewater by settling or flotation. Screens, screens, sand traps, equalization, settling and flotation ponds are the most common physical treatment units.

- **Chemical Purification:** Separation from wastewater by using chemicals such as coagulants and polyelectrolytes in order to ensure the precipitation of substances that are dissolved in wastewater or suspended in the wastewater but cannot precipitate spontaneously.

- **Biological Purification:** It is the process of removing organic-based solids dissolved in wastewater, which cannot be removed at the desired level by physical or chemical methods, from wastewater with the help of microorganisms. Trickling filter, activated sludge, stabilization pond (oxidation pond) are the main biological treatment units.
- **Advanced Purification:** It is a treatment process used to remove pollutants (nitrogen, phosphorus, heavy metals, toxic organic substances, etc.) that cannot be adequately treated by physical or biological treatment methods or that cannot be treated. Nitrification, denitrification, adsorption, ion exchange etc. are the main advanced treatment methods.

- **Natural Purification System:** It is the process of settling pollutants in artificial wetlands and treating wastewater with plants that can live in this environment.

WASTE

Municipal Waste and Disposal

This indicator shows the amount of waste collected by or on behalf of municipalities and the amount of municipal waste landfilled. The most significant amount of municipal waste is waste generated by households. It also includes waste from trading and commercial establishments, office buildings, institutions and small businesses.

Landfilling of Waste

Landfill is a site where wastes are disposed of underground or aboveground according to certain technical standards, except for units where wastes are temporarily stored for recovery, pre-treatment or disposal within the facility where they are generated, facilities where waste is interim stored for less than 3 years in order to be subjected to recovery or pre-treatment, and facilities where waste is interim stored for not more than one year in order to be subjected to disposal. This indicator includes information on the number of sanitary landfill facilities and the proportion of population served.

Medical Waste

The total amount of infectious, pathological and sharps waste in the declarations made by medical waste generators (waste producers) to the Waste Declaration System.

Waste Oil

Refers to the amount obtained from the declarations made by waste generators to the Waste Declaration System of lubricants that are not suitable for their original intended use and have waste codes in Annex-1 of the Waste Oil Management Law.

Vegetable Waste Oils

The amount of vegetable waste oils evaluated within the scope of the code "20 01 25 - Edible oils and fats" and used frying oils evaluated within the scope of the code "20 01 26* - Edible oils and fats other than 20 01 25 (A)" in the Annex-4 Waste List of the By-Law on Waste Management published in the Official Gazette dated 02/4/2015 and numbered 29314, from the declarations made by waste generators to the Waste Declaration System.

Waste Batteries and Accumulators

Indicates the total amount of waste batteries and accumulators obtained from the declarations made by waste generators to the Waste Declaration System.

End-of-Life Tires

Refers to the amount obtained from the declarations made by end-of-life tire producers (waste generators) to the Waste Declaration System.

End-of-Life Vehicles

It refers to the number of vehicle deregistration and disposal forms issued for M1 (motor vehicles for passenger transportation with a maximum seating capacity of 8 persons except the driver), N1 (motorized freight transport vehicles with a maximum mass not exceeding 3500 kg) category vehicles and three-wheeled vehicles other than motorcycles and motor bicycles within the scope of the "Law on the Control of End-of-Life Vehicles".

Waste Electrical and Electronic Equipment

Waste electrical and electronic equipment quantities obtained from the declarations made by waste generators to the Waste Declaration System.

Packaging Waste

It includes information on the quantities and recovery of wastes of sales, secondary and transportation packaging, including end-of-life reusable packaging used for the presentation of the product during the delivery of products or any material to the consumer or end user, excluding production residues, and discarded or left in the environment after the use of the product.

Economic Enterprise (for packaging waste)

It covers packaging manufacturers, marketers and suppliers.

Mining Waste

Refers to wastes determined according to the results of the survey conducted in all mining enterprises in the coal and lignite extraction, metal ore mining, other activities supporting mining and quarrying sector and all mining enterprises employing 10 or more people in the other mining and quarrying sector.

Hazardous Waste

It refers to the amount of hazardous waste obtained from the declarations made by waste generators to the Waste Declaration System.

Non-hazardous Waste

Non-hazardous waste quantities obtained from the declarations made by waste generators to the Waste Declaration System.

Wastes Produced by Ships

Wastes generated by ships: Refers to wastes generated during the normal operations of a ship and covered by MARPOL 73/78 Annex I (oil and oil-derived wastes), Annex II (toxic liquid wastes), Annex IV (sewage) and Annex V (garbage).

Recycling

It is the transformation of waste into a similar substance or a new raw material, product or energy through some processes. For example, obtaining nylon yarn from PET bottles, recycling paper into paper, obtaining energy by using waste as fuel in incineration plants, obtaining compost or biogas from organic waste, etc.

LAND USE

General Land Cover Distribution

According to the Coordination of Information on the Environment (CORINE) Project, the types of use are divided into two.

1- Land Cover: This refers to land covered by biological or physical elements. For example, natural maquis areas, natural cliffs, natural meadows, etc.

2- Land Use: It refers to the land uses resulting from human impact.

This indicator refers to the proportional representation of land use types determined according to the Coordination of Environmental Data Project and the comparison of land use changes.

The land use types identified according to CORINE are:

1. Artificial Zones: Most of these areas are covered by buildings and transportation network.

2. Agricultural Areas: This includes both cultivated agricultural areas and pasture areas.

3. Forest and Semi-Natural Areas: Areas consisting of forest, maquis, herbaceous plants and open areas with no or few plants.

4. Wetlands: All waters, marshes, reeds and peatlands, natural or artificial, permanent or temporary, stagnant or flowing, fresh, brackish or salty, covering depths not exceeding six meters during the ebb of the tidal movements of the seas, which are important as a habitat for living creatures, especially water birds, and places that are ecologically wetlands from the coastal edge line of these areas towards the land side.

5. Water Bodies: Water bodies covering terrestrial waters (river surfaces) and marine waters (lagoons, estuaries, seas and oceans).

Misuse of Agricultural Land

It refers to the permission given by laws or Laws to change the intended use of agricultural land out of agriculture.

Erosion Threatened Area

Erosion is the transportation of soil from its natural environment with the effects of water, wind and gravity. Although erosion is a natural event, it is exacerbated by the effects of water, wind and gravity as a result of the deterioration of the natural structure of the land. Although various types of erosion are seen in almost all of the country's soils, the most common is water erosion. This indicator is based on the erosion occurring in agricultural, forest and pasture areas.

erosion is shown together with their severity.

BIOLOGICAL DIVERSITY

Biodiversity

Biodiversity is the totality of genes, species, ecosystems and ecological phenomena in a region. In other words, biodiversity encompasses all the genes in a region, the species that carry these genes, the ecosystems that harbor these species and the events (processes) that link them together.

Protected Areas

According to the definition updated in 2008 by the World Union for Conservation of Nature (IUCN), protected areas are areas with clearly defined geographical boundaries, recognized, dedicated and managed by legal or other effective means for the long-term conservation of nature and associated ecosystem services and cultural values.

Forest Area

The size of the area with a certain amount of forest cover in hectares.

Normal Closed Forest

Forests where the canopy of trees covers 11-100% of the area.

Gapped Closed Forest

Forests where the canopy of trees covers less than 10% of the area.

Tree Wealth

It is the sum of cylindrical stem volumes in m^3 of stems with a chest diameter of 8

cm and above.

Definitions Related to Forest Facility Studies; Functional Forestry

This indicator refers to the areas in the total forested area allocated for forest product production, nature conservation, erosion prevention, hydrological, aesthetic, ecotourism and recreation, climate protection, public health, national defense and scientific use.

Tree Wealth

It is the sum of cylindrical stem volumes in m^3 of stems with a chest diameter of 8 cm and above.

Pasture improvement

In order to increase the feed efficiency of meadows and pastures in terms of quality and quantity; irrigation, fertilization, weed control, seeding, planting, planting seedlings and similar biological techniques, as well as the construction of facilities to facilitate grazing and the implementation of various physical, technical and administrative measures for soil conservation.

Rehabilitation

The protection of existing species in degraded or unproductive forest areas, grafting, revitalization cutting, planting of species that grow naturally in forests in vacant areas and planting of grafted or ungrafted seedlings of these species.

Erosion control

Studies covering the measures taken against the erosion and transportation of the soil on the bedrock on the earth by various factors.

Artificial Tensile

It refers to soil cultivation, sapling removal, barbed wire enclosure works with machinery and manpower.

Special Afforestation

Afforestation in degraded forest areas, treasury lands and owned lands by village legal entities, municipalities, associations, foundations, chambers, commercial companies with legal personality and real persons in accordance with the project approved by the Ministry of Agriculture and Forestry.

INFRASTRUCTURE AND TRANSPORTATION

Road and Rail Road Network

It refers to total road (highways, state roads, provincial roads) and railway development and length.

Amount of Freight and Passengers Carried by Transportation Types

This indicator shows the percentage distribution between modes of transport within the country for freight and passengers.
* Passenger-Km: A unit of traffic measurement obtained by transporting one passenger over a distance of one kilometer,
** Ton-Km: A unit of traffic measurement obtained by transporting one ton of cargo over a distance of one kilometer.

Number of Motorized Land Vehicles

Number of motor vehicles including automobiles (including off-road vehicles), minibuses, buses, vans, trucks, trucks, motorcycles, special purpose vehicles, road and construction equipment and tractors.

ENERGY

Total Energy Consumption

It is the amount of energy resources that enterprises consume as final, energy cycle and non-energy.

Total Energy Consumption by Sector

This indicator shows the total energy consumption in oil equivalent for the residential, industrial, transportation, agricultural, non-energy, and conversion sectors.

Gross Domestic Energy Consumption,

It represents the amount of energy required to meet a country's domestic consumption. Gross domestic energy consumption is calculated by the formula primary production + re-products + total imports - stock changes - total exports - exports.

Primary Energy Consumption

Primary energy consumption is the gross domestic energy consumption minus non-energy uses of energy.

Final energy consumption

The amount of final energy used by enterprises for the production of goods and services, space heating and transportation. This indicator refers to the sum of energy supplied to end-users for all energy sources. It corresponds to total final energy consumption in energy balance tables. Final energy consumption in industry includes consumption in all industrial sectors except the energy sector. Petrochemical Feedstock values are evaluated in the

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Cycle sector. The amount of fuel converted by autoproducers in power plants and coke converted into blast furnace gas is considered as part of the conversion sector, not industrial consumption. The final amount of energy consumed in transport includes all types of transport such as railways, roads, highways, airlines and national shipping. The residential service sector is included together.

Primary Energy Production

It refers to the amount of energy production from solid fuels such as coal and wood, oil, gas and renewable sources and the ratio of each source to the total amount of energy produced.

Share of Renewable Energy Sources in Consumption

This indicator shows the proportion of total energy consumption derived from renewable energy sources (wood, animal and plant residues, hydro, geothermal, wind and solar). Renewable energy sources correspond to energy supplied from existing external environmental energy flows or substances derived from them.

Primary and Final Energy Intensity

The intensity calculated as the ratio of primary energy consumption to GDP is called primary energy intensity, while the intensity calculated as the ratio of final energy consumption to GDP is called final energy intensity.

Energy Consumption in Cycle Processes

The amount of energy consumed by enterprises in electricity generation, heat generation, coke ovens and blast furnaces.

Non-Energy Consumption

The amount of energy consumed when enterprises do not use an energy source for energy purposes but use it as raw material, etc.

INDUSTRY AND MINING

Environmental Impact Assessment (EIA)

It covers the studies to be carried out in determining the positive and negative impacts of the projects planned to be realized on the environment, in determining and evaluating the measures to be taken to prevent or minimize the negative impacts to the extent that they will not harm the environment, in determining and evaluating the selected location and technology alternatives, and in monitoring and controlling the implementation of the projects.

EIA Positive

Taking into account the evaluations made by the Scoping and Review and Evaluation Commission on the Environmental Impact Assessment Report, the decision of the Ministry stating that there is no objection to the realization of the project upon determining that the negative effects of the project on the environment are at acceptable levels according to the relevant legislation and scientific principles as a result of the measures to be taken

EIA Negative

The decision of the Ministry stating that the implementation of the project is impracticable due to its negative impacts on the environment, taking into account the assessments made by the Scoping and Review and Evaluation Commission on the Environmental Impact Assessment Report.

AGRICULTURE

Agricultural Area per Capita

It is defined as the ratio of total arable agricultural area to total population.

Chemical Fertilizer Use

It refers to the amount of active substance (Nitrogen, Phosphorus, Potash) in the amount of artificial fertilizer consumed in the agricultural sector.

Pesticide Use

Refers to total annual pesticide use.

Organic Agriculture

Organic agriculture is a form of agricultural production that is controlled and certified at every stage from production to consumption, using inputs permitted by the Law, without using chemical inputs in production. This indicator refers to the quantity and area of agricultural products produced by organic farming methods.

Good Agricultural Practices

According to the Law published in the Official Gazette dated December 7, 2010 and numbered 27778; good agricultural practices: refers to the

procedures that should be applied in order to make the agricultural production system socially livable, economically profitable and efficient, protecting human health, animal health and welfare and caring for the environment.

FISHERY

Aquaculture Production

Indicates the amount of fish, shellfish and molluscs fished in our seas, freshwater products fished in our inland waters and aquaculture products produced each year. Data on production is expressed in live weight, which is the weight at the time of catch or production.

Fishing Fleet Capacity

It shows the expression of the total number of fishing boats in terms of engine power.

TOURISM

Tourist Numbers

The number of tourists is the sum of the number of foreign visitors to Turkiye and the number of citizens residing abroad minus the number of day-trippers.

Blue Flag Applications

The Blue Flag, an international environmental award given to qualified beaches and marinas that meet the required standards, has been implemented in Turkiye since 1994. From 2008 onwards, yachts will be included and from 2021 onwards tourism boats will also be included, indicating the total number of beaches, marinas, yachts and tourism boats by years.

DISASTER

Forest Fires

This indicator is the expression of the total area of forest burned within the total forest area by years.

Disasters by Type

Hydrological (floods, landslides), meteorological (storms, avalanches), geophysical (earthquakes, volcanic activity) and climatic (temperature anomalies, droughts, fires) types of natural disasters, as well as industrial accidents, traffic accidents, pipeline transportation, etc., and the periodic number of occurrences and the loss of life and property caused by them.

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