REPUBLIC OF TURKEY
MINISTRY OF ENVIRONMENT,
URBANIZATION AND CLIMATE CHANGE

ENVIRONMENTAL INDICATORS

GENERAL DIRECTORATE OF ENVIRONMENTAL IMPACT ASSESSMENT, PERMIT AND INSPECTION

ANKARA 2021

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ANKARA 2021

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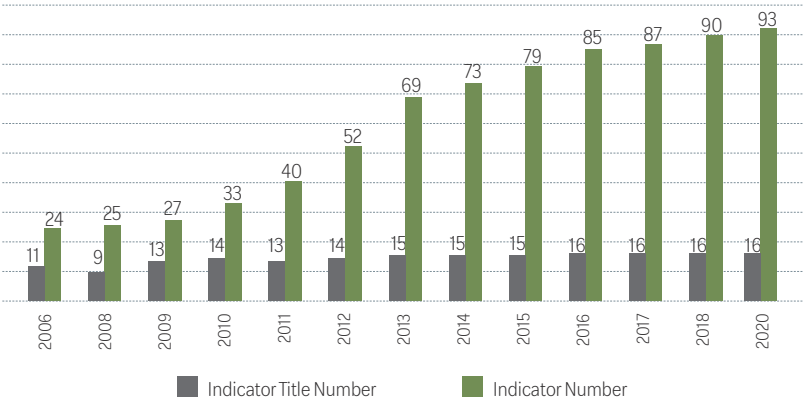
CLASSIFICATION OF INDICATORS

ENVIRONMENTAL INDICATORS

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 ensure that the interactions between the environment and human activities are monitored numerically. They aim to reflect the relationship between the environment and the sectors, to ensure that some activities with environmental effects can be observed in the course of time and the results of the implemented environmental policies can be monitored, to assist in the determination of plans, programs, and policies, and the preparation of legislation, and to provide information.

Environmental Indicators Booklets are published every year with updated environmental indicators. While the initial publication, "Environmental Indicators 2006," included 11 titles and 24 indicators, it is now being revised to include 16 titles and 93 indicators.

Data quality is of great importance in environmental information management. In general, the data and evaluations regarding the indicators in this booklet have been obtained from the relevant authorized institutions that produce these data. Therefore, it should be pointed out that the accuracy and reliability of this data are under the responsibility of the data-providing institutions.



CLASSIFICATION OF INDICATORS

In the world, various approaches are applied related to the development of environmental indicators; indicator sets are created within different conceptual frameworks or models. One of them is the "Pressure-State-Response" (PSR) framework. The OECD (Organization for Economic Cooperation and Development) developed and established a comprehensive indicator system to serve as a basis for environmental policies and reporting studies in 1994. Another model, the DPSIR framework, was created by the EEA (European Environment Agency) in 2004, developing the PSR framework to define the relationship between society and the environment. This model includes five elements such as Driving force, Pressure, State, Impact, Response. With this approach, it is possible to measure the effectiveness of the measures implemented and, in other words, to explain the entity relationship between driving forces and impacts.

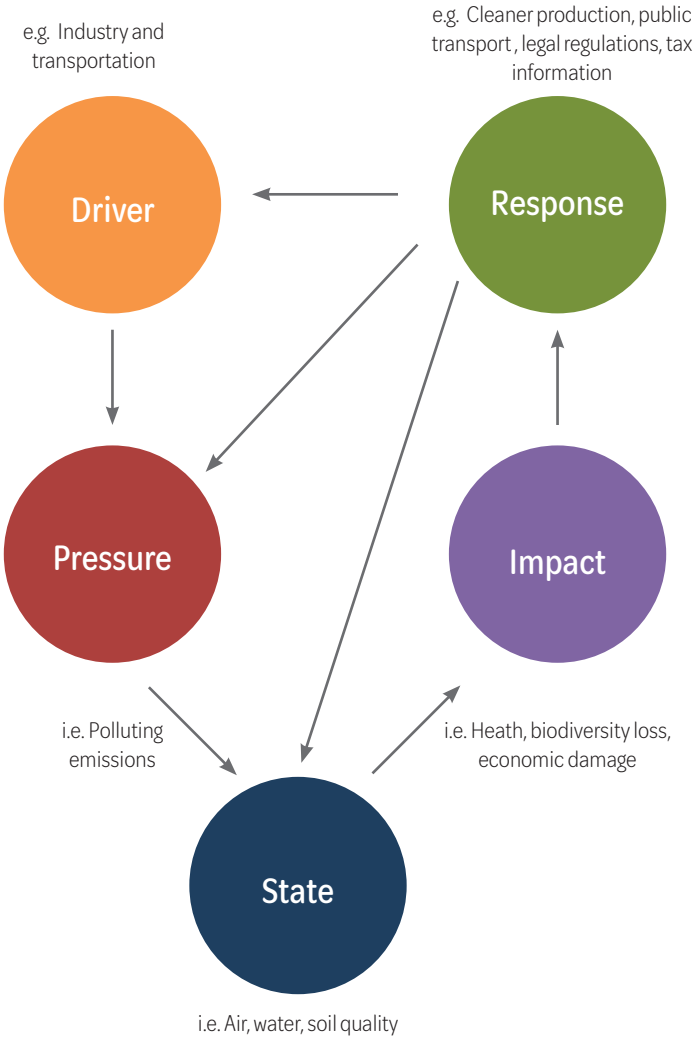
D Driving force indicators: These indicators are the factors behind various variables. Generally speaking, all economic activities are classified in this group.

P Pressure indicators: They define the variables that cause or can cause environmental problems. These indicators are those that focus directly on the sources of problems. Generally speaking, all emissions are classified in this group.

S State indicators: They are indicators to reveal the current state of the environment. Generally, all concentration measurements are classified in this group.

I Impact indicators: These are the most extreme effects caused by environmental changes. In general, indicators related to health problems resulting from environmental changes are classified in this group.

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, improve or adapt to these changes. In other words, indicators related to solutions against environmental pollution are classified in this group.


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 classify the indicators in the booklet accordingly as follows;

Driving Force Indicators	Pressure Indicators	State Indicators
• Population Growth • Urban- Rural Population Ratio • Migrant Population • Resource Efficiency • Domestic Material Consumption per Capita • Consumption of Ozone-Depleting Substances (ODS) • Amount of Passengers and Freight by Transport Types • Final Energy Consumption by Mode of Transport • Fuel Consumption by Mode of Transport • Share of Alternative Fuel Vehicles • Average Age of Vehicles Registered to the Traffic • Real Change in Transport Prices by Mode • Taxes / Expenditures and Subsidies in Railway Transport • Total Energy Consumption by Sectors • Primary Energy Consumption by Fuel Type • Final Energy Consumption by Sectors • Primary Energy Consumption per Capita • Primary Energy Production • Final Energy Intensity	• Greenhouse Gas Emissions • Total Greenhouse Gas Emissions by Sectors • Air Pollutants Emissions • Large Combustion Plants • Use of Freshwater Resources • Abstraction for Municipal Water Supply Networks • Waste Production Quantities • Misuse of Agricultural Lands • Invasive Alien Species • Highway - Railway Network Intensity • Greenhouse Gases Emissions by Transport Types • Emissions of Air Pollutants by Transport • Number of Motor Vehicles • Number of Mining Facilities According to their Groups • Chemical Fertilizer Consumption • Use of Pesticides • Aquaculture Production • Fishing Fleet Capacity • Number of Tourists • Tourist Overnights and Beds per 1000 Inhabitants • Technological Accidents	• Life Expectancy at Birth • Access to Reliable Drinking Water • Sectoral Distribution of Employment • Sectoral Distribution of Gross Domestic Product • Temperature • Average Concentrations of PM10 and SO2 in Ambient Air • Number of Exceedances of Air Quality Limit Values • Oxygen Consuming Substances in Rivers • Nutrients in Freshwater Resources • Chlorophyll-a Concentration in Coastal and Marine Waters • Nutrients in Coastal and Marine Waters • Oxygenation Status in Seas • Bathing Water Quality • General Distribution of Land Cover • Zones at Risk of Erosion • Distribution of the Forest Areas • Distribution of Forests by Tree Species • Agricultural Land per Capita • Blue Flag Applications

Impact Indicators	Response Indicators
• Waterborne Diseases • Precipitation • Sea Water Temperature • Heating and Cooling Day-Degrees • Storm Disaster Numbers • Number of Endangered Species (Biodiversity) • Natural Disasters • Forest Fires	• Environmental Protection Expenditures • Carbon Sinks and Capture • Number of Air Quality Monitoring Stations • Municipalities Served by Wastewater Treatment Unit • Repayment of Energy Incentives for Wastewater Treatment Plant • Municipalities Served by Sewerage Systems • Municipal Waste Disposal • Disposal and Recycling of Various Wastes • Protected Areas for Biodiversity • Wildlife Conservation Activities • Regulation and Control of the Trade of Wild Animals According to the International Conventions • Forest Establishment Activities • Share of Renewable Energy Sources in Consumption • Ratio of Electricity Generated from Renewable Sources • Primary Energy Intensity • Energy Efficiency in Buildings • Share of the Total Domestic and International Sales Values of the Products of the Enterprises Operating in the Organized Industrial Zones in All Industrial Enterprises • Number and Area of Mines Closed After Being Operated • Number of Laboratories Operating under Environmental Legislation • Environmental Impact Assessment Decisions • Organic Farming Areas and Production Amounts • Good Agricultural Practices • Number of Environment-Friendly Accommodation Facilities • Risk Assessment and Emergency Response • Liability Insurance

INDICATORS SUMMARY TABLE

TREND OVER THE PREVIOUS YEAR IN TERMS OF ENVIRONMENTAL IMPROVEMENTS

Key

↑	Negative Developments Increasing Trend
↓	Negative Developments Decreasing Trend

↑	Positive Developments Increasing Trend
↓	Positive Developments Decreasing Trend

→	Neutral Developments
x	Comparative Data Not Available.

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

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

HEALTH	
Life Expectancy at Birth	↑
Access to Reliable Drinking Water	↑

CLIMATE CHANGE	
Greenhouse Gas Emissions	↑
Carbon Sinks and Capture	↑
Consumption of Ozone-Depleting Substances (ODS)	↓
Precipitation	↓
Temperature	↑
Mediterranean Sea Surface Temperatures	↓
Aegean Sea Surface Temperatures	↓
Black Sea Surface Temperatures	↓
Marmara Sea Surface Temperatures	↑
Heating and Cooling Day-Degrees	↑
Storm Disaster Numbers	↑

AIR POLLUTION	
NH_3, CO, PM_{10} and NMVOC Emissions	↑
NOX ve SO_2 Emissions	↓
Number of Large Combustion Plants and Total Thermal Power	↑
Number of Exceedance of Air Quality Limit Value for PM_{10} Parameters	↑
Number of Exceedance of Air Quality Limit Value for SO_2 Parameters	↑
The Number of Air Quality Monitoring Stations	↑
Oxygen Consuming Substances in the River Waters of Buyuk Menderes, Konya and East Eastern Black Sea Basins	↑

WATER – WASTEWATER	
Total Use of Freshwater Resources	↑
Oxygen Consuming Substances in River Waters in the Büyük Menderes Basin	↓
Oxygen Consuming Substances in River Waters of Eastern Mediterranean, Eastern Black Sea, and Kızılırmak Basins	↑
Nitrate Nitrogen in the Eastern Black Sea Basin	→
Nitrate Nitrogen in Büyük Menderes Basin	↓
Nitrate Nitrogen in the Kızılırmak Basin	↑
Rate of Class A Quality Bathing Waters	↑
Amount of Water Abstracted for Municipal Water Supply Network	↑
Rate of Number of Municipalities Served by Wastewater Treatment Plants to the Total Number of Municipalities	↑
Rate of Population Served by Wastewater Treatment Plants to the Total Municipal Population	↑
Energy Incentive Payments for Wastewater Treatment Plants	↑
Rate of Number of Municipalities Served by Sewerage System to Total Number of Municipalities	↑
Rate of Population Served by Sewerage Systems in Total Municipal Population	↑
Average Amount of Daily Wastewater Discharged by Municipalities via Sewerage Network Per Capita	↑

WASTE	
Number of Landfills	↑
Rate of the population served by landfills to the total municipal population	↑
Recovery Rate of the Hazardous Waste	↑
Number of End of Life Vehicles	↑
Amount of Mining Waste	↑
Amount of Packaging Waste Recovered	↓

LAND USE	
Artificial Areas	↑
Agricultural Areas	↓
Forest and Semi-Natural Areas	↓
Wetlands	→
Zones at Risk of Erosion	X

BIODIVERSITY	
Total Number of Species, Endangered Species, Endemism Rate	X
Number of Invasive Alien Species	→
Protected Area Size	→
Protected Coastal Length	↑
Wildlife Conservation Activities	↑
Forest Areas	↑
Forest Establishment Activities	↓

INFRASTRUCTURE AND TRANSPORTATION	
Highway Network	↑
Railway Network	↑
Road Passenger Transportation Rate (passenger-km)	→
Road Freight Transportation Rate (ton-km)	→
Rail Passenger Transportation Rate (passenger-km))	↑
Rail Freight Transportation Rate (ton-km)	↑
Capacity Use Ratio in Railway Freight Transportation	↓
Greenhouse Gases Emissions from Transport	↓

Emissions of Air Pollutants from Transport	↓
Final Energy Consumption by Mode of Transport	↑
Share of Alternative Fuel Vehicles	↑
Number of Motor Vehicles	↑
Average Age of Vehicles Registered to the Traffic	↑
Payments Under Public Service Obligation in the Railway Sector	→

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	↑
Rate of Electricity Generated from Renewable Sources	↑
Primary Energy Intensity	↓
Final Energy Intensity	↓
Energy Efficiency in Buildings	↑

INDUSTRY AND MINING	
The share of the Total Domestic and International Sales Values of the products of the Enterprises Operating in the Organized Industrial Zones in All Industrial Enterprises	↑
Yearly Number of Issued Mining Licenses	↓
Number of Mining Sites/Facilities Rehabilitated After Being Operated	↓
Area of Mining Sites/Facilities Rehabilitated After Being Operated	↓
Number of Laboratories Operating under Environmental Legislation	↑

AGRICULTURE	
Agricultural Land Per Capita	↓
Chemical Fertilizer Consumption	↑
Use of Pesticides	↑
Share of the Organic Farming Lands to the Total Agricultural Lands	↓
Good Agricultural Practices Cultivated Areas	↓

FISHERIES	
Aquaculture Fishing	↓
Aquaculture Production	↑
Number of Fishing Vessel	↑
Total Engine Power of the Fishing Fleet	↑

TOURISM	
Number of Tourists	↓
Environment-Friendly Accommodation Facilities	↑
Number of Nights Spent Per 1000 Inhabitants	↓
Number of Tourist Beds Per 1000 Inhabitants	↑
Number of Blue Flag Beaches	↑
Number of Blue Flag Marinas	→

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

EXECUTIVE SUMMARY

According to the content of the Environmental Indicators booklet;

Population

According to TURKSTAT data for 2020, Turkey's total population increased by 459,365 people from the previous year to 83,614,362 people. The population growth rate in Turkey, which was 1.39 % in 2019, decreased to 0.55 % in 2020. If current trends in demographic indicators continue, the population of Turkey is expected to reach 86,907,367 in 2023 and 100,331,233 in 2040.The population will increase until the year 2069, and reach its highest value with 107,664,079 people. The country's population is supposed to decrease after this year, reaching 107,100,904 people in 2080.

The provinces with the highest number of migrations received in the 2019-2020 period were Tekirdağ, Yalova, and Muğla while those with the highest number of sending migrations were Gümüşhane, Bayburt, and Tokat.

Economy

While the gross domestic product (GDP) was 1.6 Euro for each kilogram of material consumed in Turkey in 2020, this figure was 2.2 Euro in the EU-27 countries.

Turkey's domestic material consumption per capita was 12.1 tons in 2018, below the EU-28 average of 14.2 tons.

Environmental protection expenditure increased by 1.2 % in 2019 compared to the over the previous year, totaling 38.4 billion TL.

Health

Although life expectancy in Turkey has increased, it is still below that of the European Union average with 78.6 years in the 2017-2019 period. In Turkey, it is anticipated that the life expectancy at birth will increase and the population will continue to age. According to TURKSTAT data whereas 95.3% of Turkey's population benefited from the piped water system in 2006, this percentage increased to 99.5 % by 2020.

Climate Change

Total greenhouse gas emissions (CO_2-equivalent) in Turkey decreased by 3.1% compared to the previous year and reached 506.1 million tons.

Although the equivalent (per capita) greenhouse gas emissions increased in parallel with energy consumption in Turkey, it was calculated as 6.1 tons CO_2/capita in

2019, below the average of EU countries. The energy sector has the highest share of greenhouse gas emissions, with 72%.

Annual precipitation decreased by 12.9% across the country, and by 14.5% when compared to the previous year's precipitation. Although 2020 is the sixth year with the least precipitation in the last 40 years, it is also the year with the most extreme precipitation.

Turkey's average temperature in 2020 was 14.9 °C, 1.4 °C higher than the 1981–2010 average of 13.5 °C

Energy

The utilization of renewable energy resources is critical for providing benefits for greenhouse gas reduction per unit energy consumed. The amount of energy supplied from renewable sources increased by 148% in 2019 compared to 1990. The total amount of energy consumption increased by 175 % throughout that time, while the net amount of electrical energy consumed increased by 449%. Because of the increased use of renewable resources, the share of renewable resources in primary energy consumption reached 16.6 % and 44.0 % in gross electricity generation.

Primary energy intensity, which is an indicator of energy efficiency, was 0.114 kTOE (Tons of Oil Equivalent)/ 2010$ in 2019. Although this rate was lower than the world average of 0.172 kTOE/ 2010$, it was above those of OECD and EU-28 countries.

Industry

Analyzing the distribution of the 6,118 "EIA Positive" decisions made in our country since 1993, when the first EIA regulation was published, until the end of 2020, it becomes apparent that investments in petroleum and mining lead with 28%, investments in the energy sector with 23%, investments in the waste and chemical sector with 14%, and investments in the agriculture-food sector with 13%.

Air Quality

Despite the decrease in air pollutant emissions in recent years, it is observed that air pollution continues to be a problem. The total number of the limit value exceedances of pollutants was 17601 for the PM_{10} parameter and 350 for the SO_2 parameter in 2020. The national limit value and the European Union limit value was exceeded by 11% in 2020. The stations with the highest annual averages in the last five years have been

Bursa, Iğdır, Adana, and Şırnak for the PM_{10} parameter, and Edirne and Trabzon for for the SO2 parameter.

The effect of heating-related pollutants on air pollution remains a concern, especially during in the winter. It is presumed that additional measures, as well as the continuation of existing ones, are required to improve air quality.

Water- Wastewater

According to DSI (the State Hydraulic Works) data, sectoral water uses for 2020 are 44 billion m^3 (76.8%) in Irrigation, 13.30 billion m^3 (23.2%) in Drinking, Utilization and Industry. Total water use is 57.30 billion m^3 (40.7 billion $m^3$of which is for surface and 16,60 billion $m^3$of which is for ground water use).

Pollution and eutrophication in our river basins and seas are thought to be caused by urban, industrial, and agricultural wastewater. Phosphorous compounds have been measured at their highest levels in all seasons in the Gulf of Bandırma of the Marmara Sea, highlighting the permanent existence of industrial and domestic pressures.

As a result of the significant investments in wastewater treatment made in our nation, the ratio of the municipalities served by wastewater treatment plants to all municipalities reached 51% in 2020. The ratio of the municipal population served by wastewater treatment plants to the total municipal population is 77.7%. The Ministry of Environment, Urbanization, and Climate Change provided a support payment of 153 million TL to 628 facilities in 2020 in order to ensure the effective functioning of wastewater treatment plants and to enhance the water quality of the receiving environments as part of energy incentives.

While 74% of the swimming areas monitored in our swimming waters in 2019 were Class A (very good), this rate decreased to 83% in 2020.

Waste

The amount of waste produced increases in parallel with the constantly increasing population and consumption. The ratio of the population served by landfill and the rate of waste recovery has increased as a result of studies and environmental investments, particularly the zero waste movement, carried out in accordance with general waste management principles. Nonetheless, the overall recovery rate remains lower than the EU average.

Land Use

Land use is considered important for protecting the environment and natural resources, as well as preventing climate change and promoting sustainable development, and it aims to protect natural areas while limiting the rate of built-up areas. In our country, as in the rest of the world, there has been a decrease in the rate of natural areas and an increase in the rate of built-up areas. The amount of agricultural land available for non-agricultural use was lower this year than in previous years.

Biodiversity

Turkey is the gene center of several plant species. Although the country has a special position in the world in terms of biodiversity, some of our plant and animal species are endangered, and some of our species that existed before have already been extinct.

For example, the rate of endemism in the flowering plant group among seed plants is nearly 34%. Although Turkey is very rich in endemic plants, some of these species face serious threats.

While the ratio of the total protected areas to the country's area was 8% in 2016, it increased over the years and reached 9% in 2020.

Infrastructure and Transportation

The transportation sector continues to be one of the leading sectors in terms of its environmental impacts. In Turkey, the number of motor vehicles is increasing with the population, but the ratio of motor vehicles to the population is far lower than the average for the European Union.

16.1% of the total greenhouse gas emissions were caused by transportation, and 93% of this was caused by road transportation in 2019. It was observed that the amount of greenhouse gas emissions from transportation was lower than it was in 2017.

The majority of the 26,808 thousand TOE (Tons of Oil Equivalent) energy consumed in Turkey's transportation sector, excluding pipelines, was provided by fossil fuels. The number of electric-hybrid vehicles is increasing in the fuel distribution based on the types of vehicles registered in traffic, reaching 82,710 by 2020.

Agriculture

Agricultural activities are among the important sources of environmental pollution. Irrigation, use of fertilizer and chemicals, and land-use changes are the primary

environmental pressures. The number of chemical fertilizers as pure plant nutrients (N, P_2O_5, K_2O) used in Turkey was 3,210,698 tons as of the end of 2020 with an 30.18% increase compared to 2019. The amount of chemical fertilizer used as pure plant nutrient per hectare of agricultural land in Turkey was around 164 kg as of the end of 2020.

The total consumption of pesticides in Turkey increased by 4.6% compared to 2019 and reached 53,672 tons in 2020.

Fisheries

The production of fishery products obtained by hunting in our country is above the sustainable stock capacity as it is in the world. For this reason, the basic approach accepted by scientists in hunting is to maintain the sustainability of the stocks to meet the needs of production. According to TURKSTAT data, the fisheries production decreased by 6.1% in 2020 compared to 2019 and amounted to 785,811 tons. The aquaculture fishing in marine and inland waters decreased by 21.3%, while aquaculture production increased by 12.9% in 2020 compared to the previous year. The further growth of the fleet has been limited by denying licenses for new vessels since 2002 to protect the aquaculture resources and to ensure the sustainability of our fisheries. Furthermore, since 2012, support payments have been made to fishermen who want to exclude their vessels from fishing based on vessel size in exchange for license cancellation. The total number of vessels is reduced with the impact of this policy. Nevertheless, the commercial fishing pressure on fish stocks cannot be reduced since the total fishing effort, that is the total engine power of the fishing fleet, is increasing.

Tourism

Turkey ranks high in the world in terms of tourist arrivals and tourism revenues. The number of tourists in 2019 increased by 11.85% compared to 2018. However, due to the global Covid-19 epidemic, the number of tourists decreased by 68.95 % in 2020 compared to 2019. 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 generation, noise, etc. As a result of the studies carried out as a precaution to this, the number of accommodation facilities with Tourism Management Certificate was 4,218 as of the end of 2020. 473 of these facilities (11.21%) have been certified with an Environment-Friendly Accommodation Facility Certificate (Green Star). Also, Turkey ranks third after Spain and Greece with 486 blue-flagged beaches, and seventh in the world with 22 marinas according to 2020 data. This situation necessitates more measures for environmental issues in touristic areas.

1 POPULATION

1.1. Population Growth Rate

D P S I R

Population growth is important as it is a major driving force for human activities that creates pressure on the environment.

Although the population growth rate has decreased from time to time, the population of Turkey has increased continuously. The population growth rate in Turkey, which was 1.39% in 2019, decreased to 0.55% in 2020. According to the data of 2020, the total population in Turkey was 83,614,362 people, and the population density (population per km^2) increased reached 109 people. The median age in our country was 32.4 in 2019 and increased to 32.7 in 2020[1].

GRAPH 1- POPULATION AND POPULATION GROWTH RATE CHANGES OVER THE YEARS

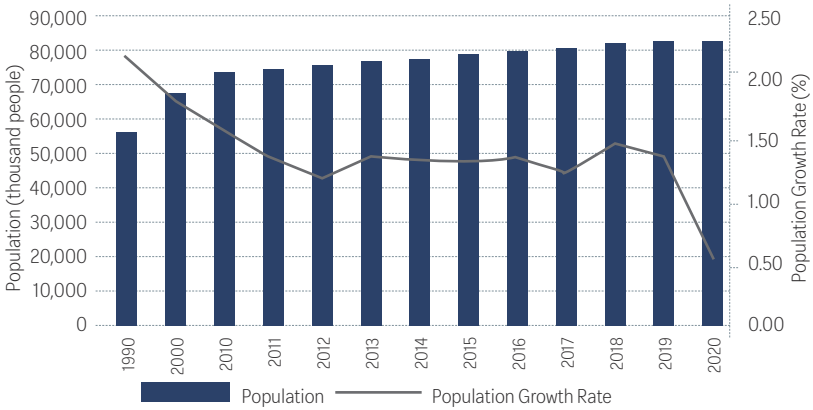


TABLE 1- POPULATION AND POPULATION GROWTH RATE CHANGES OVER THE YEARS

YEARS	1990	2000	2010	2015	2016	2017	2018	2019	2020
Population (thousand people)	56,473	67,804	73,723	78,741	79,815	80,811	82,004	83,155	83,614
Population Growth Rate (%)	2.17	1.83	1.59	1.34	1.35	1.24	1.47	1.39	0.55
Population density (capita/ km^2)	73	88	96	102	104	105	107	108	109

Source: TURKSTAT. General Population Census Results between 1990-2000 and Address Based Population Registration System results between 2010-2020 were used.

Note: Last year's administrative division structure was taken into account when calculating annual population growth rates.

Population projections are of great importance in terms of future policy-making. Determination of the current population trends and predicting future population structure in case of continuation of these trends provide healthier policies.

Turkey's population is expected to grow to 86,907,367 in 2023 and 100,331,233 in 2040. The population is expected to grow until 2069, when it will reach its peak of 107,664,079 people. Turkey's population, which is expected to decline beginning this year, is expected to be 107,100,904 people in 2080.

Life expectancy at birth is expected to increase and the population will continue to age in Turkey. The median age, which is a major indicator of the age pattern 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 YEARS, 2019-2080

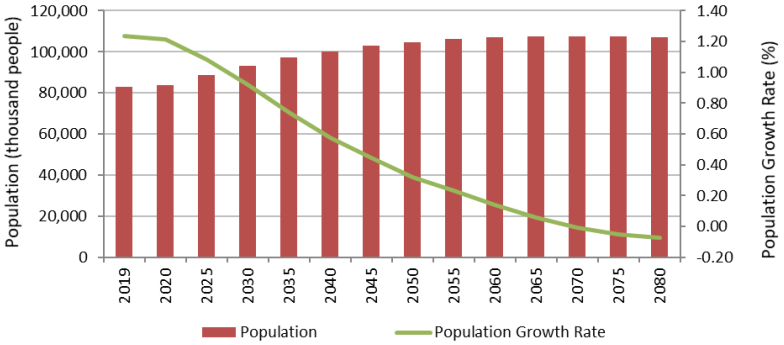


TABLE 2- POPULATION PROJECTIONS BY YEARS, 2018-2080

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 (capita/km²)	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 (capita/km²)	138	139	140	140	140	139

Source: TURKSTAT, Population Projections, 2018-2080

1.2- Urban-Rural Population Ratio

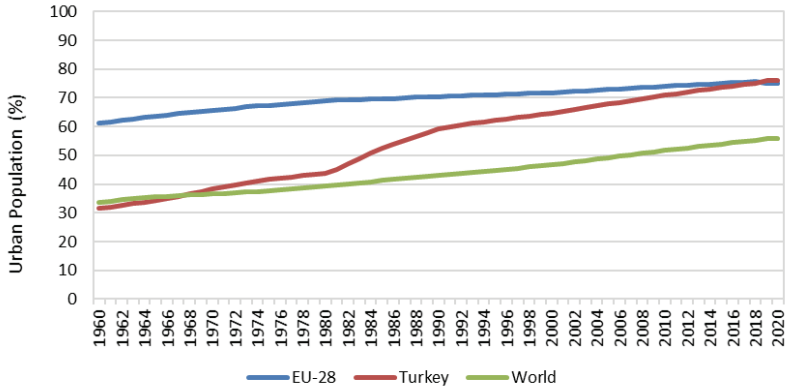
D P S I R

Urban population emerges as a driving force leading to pressure on environmental assets. While the rapid growth of the urban population correspondingly brings about an increase in urban expansion, infrastructure, transportation, housing, industrial area, and energy needs, it also brings environmental problems such as wastewater, noise, air pollution. Urbanization is one of the important processes experienced in parallel with industrialization and economic development.

According to the first census conducted in 1927, while 75.8% of the population lived in towns and villages, and 24.2% lived in provincial and district centers in Turkey, whose population was 13,648,270, however, the population started to accumulate in urban areas after 1950. According to World Bank data, the rate of population living in urban areas in Turkey was 76 % in 2020.

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

GRAPH 3- URBAN POPULATION RATIO IN TURKEY AND THE WORLD BY YEARS (%)



Source: The World Bank (World Development Indicators), https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS?- contextual=default.

1.3- Migrant Population

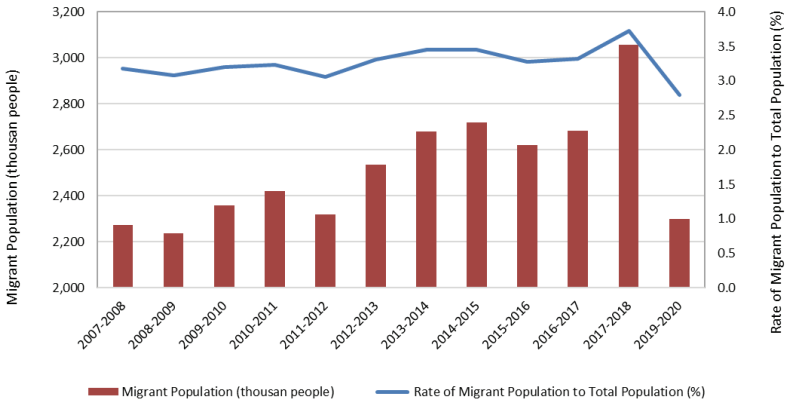
D P S I R

Internal migration is defined as changes in permanent residence addresses in certain areas within the borders of the country within a year. There are conditions required by economic development behind demographic movements such as rapid population growth and rural-urban migration.

While the population migrated between provinces in our country was 2,273,492 people in the 2007-2008 period, it was 2.3 million people in the 2019-2020 period according to the results of the Address Based Population Registration SystemWhile the share of the population migrating between provinces in the total population, which was 3.2% in the 2007-2008 period, has increased since 2018, it has decreased to 2.8% in the 2019-2020 period. The foreign population in our country is not included in these figures.

The provinces with the highest number of migrations received in the 2019-2020 period were Tekirdağ, Yalova, and Muğla while those with the highest number of sending migrations were Gümüşhane, Bayburt, and Tokat[4].

GRAPH 4- MIGRANT POPULATION, 2008-2020



Source: TURKSTAT, Address Based Population Registration System results, 2007-2018
TurkStat; Turkey Statistics 2020 Brochure,
https://www.tuik.gov.tr/media/announcements/turkiye_istatistikleri_2020.pdf
Note: The foreign national population in our country are not included.

2 ECONOMY

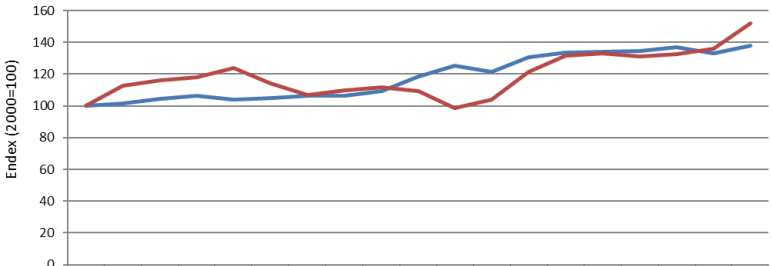
2.1- Resource Efficiency

D P S I R

Economic activities put pressure on the environment, so resource efficiency has been defined to reveal the environmental efficiency of the economy. Resource efficiency 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 domestic raw material consumed and the physical import amount and subtracting the physical export amount.

Compared to 2000, resource efficiency increased by 35% in the EU-27 economy and 36% in Turkey between 2000 and 2020 and reached the values of 2.2 €/ton and 1.6€/ ton, respectively[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
EU	100	102	105	106	104	105	107	107	109	119	125	121	131	134	134	135	137	133	138
Turkey	100	113	116	118	124	114	107	110	112	109	99	104	122	132	133	131	133	136	152

Kaynak: EUROSTAT, Resource productivity statistics,2020.

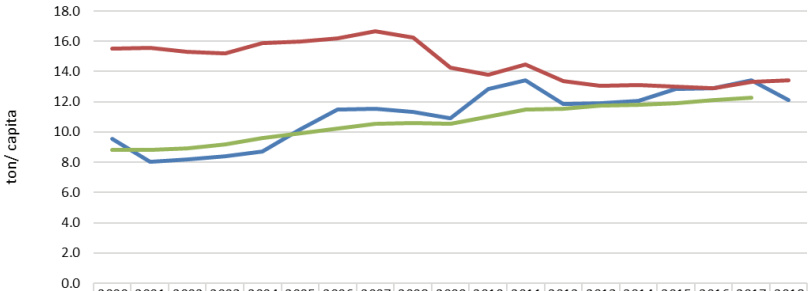
When comparing the resource efficiency indicator across countries, GDP (code: RP_ PPS) in purchasing power standards should be used.

Domestic material consumption per capita represents the level of efficient use of production and inputs used for the national economy. While domestic material consumption (DMC) per capita in Turkey was 9.5 tons in 2000, that increased to 12.1 tons in 2018. The average per capita domestic material consumption in EU-28 countries was 15.5 tons in 2000 and decreased to 13.4 tons in 2018. However, the level of domestic material consumption varies from around 9 tons per capita (Italy, UK, Spain, Netherlands and Croatia) to about 30 tons per capita (Finland, Norway and Estonia) in European countries.

Worldwide material consumption is equivalent to the world domestic material consumption when the global trade balance is zero. It was 12.1 tons per capita in 2018 and steadily increased from 8.8 tons per capita in 2000[6].

Per capita domestic material consumption in Turkey was below the average of the EU-28 countries as of 2018.

GRAPH 6- DOMESTIC MATERIAL CONSUMPTION PER CAPITA BY YEARS

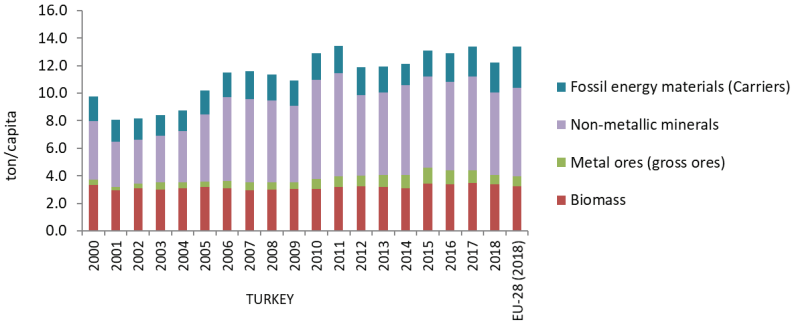


	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Turkey	9.5	8.0	8.2	8.4	8.7	10.2	11.5	11.6	11.3	10.9	12.9	13.4	11.8	11.9	12.1	12.9	12.9	13.4	12.1
EU-28	15.5	15.6	15.3	15.2	15.9	16.0	16.2	16.6	16.3	14.3	13.8	14.5	13.4	13.0	13.1	13.0	12.9	13.3	13.4
World	8.8	8.8	8.9	9.2	9.6	9.9	10.2	10.6	10.6	10.5	11.0	11.5	11.5	11.8	11.8	11.9	12.1	12.3	

Source:https://ec.europa.eu/eurostat/databrowser/view/env_ac_rp/default/table?lang=en

Looking at the distribution of domestic material consumption by material category, we find that consumption of non-metallic minerals accounts for almost half of the total material consumption in both Turkey and the EU-28 countries. Consumption of non-metallic minerals is influenced by the country's construction investments, infrastructure investments (e.g. road networks) and population density[7].

GRAPH 7- CONSUMPTION ACCORDING TO MATERIAL CATEGORY (Tons per capita)



Resources:

1) TURKSTAT, 2021

2) Eurostat

2.2- Sectoral Distribution of Employment

D P S I R

This indicator is a status indicator, which is essential because the distribution of the working population among sectors affects the quality and extent of the population's pressure on the environment.

Over the years, employment in Turkey has decreased mainly in the agricultural sector, while it has increased in the service sector. The service sector had a 56.2% share of employment in Turkey and an average share of 70.9% in the EU-27 countries, according to 2020 data.

Looking at the sectoral distribution of employment in the EU-27 countries in 2020, the share of agriculture was 4.3%, construction 6.5%, industry 18.2%, and services 70.9%. In OECD (Organisation for Economic Cooperation and Development) countries, these rates were 4.7% in agriculture, 7.1% in construction, 14.8% in industry, and 73.4% in services[8].

GRAPH 8- SECTORAL DISTRIBUTION OF EMPLOYMENT

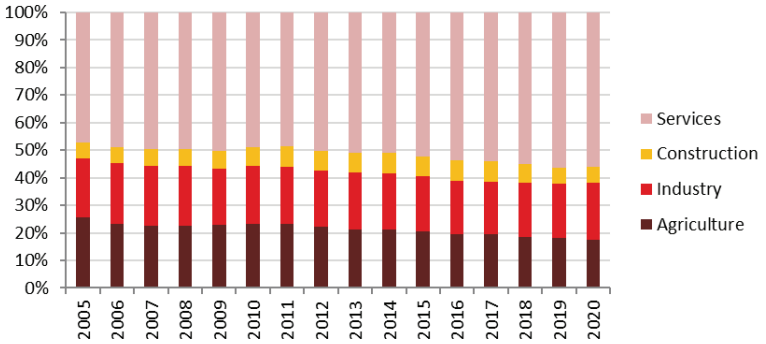


TABLE 3- SECTORAL DISTRIBUTION OF EMPLOYMENT

(+15 age)

Years	2005		2010		2015		2019		2020	
	Thousand People	%	Thousand People	%	Thousand People	%	Thousand People	%	Thousand People	%
Total	19,633	100.0	21,858	100.0	26,621	100.0	28,080	100.0	26,812	100.0
Agriculture	5,015	25.5	5,084	23.3	5,483	20.6	5,097	18.2	4,716	17.6
Industry	4,241	21.6	4,615	21.1	5,332	20.0	5,561	19.8	5,497	20.5
Construction	1,097	5.6	1,434	6.6	1,914	7.2	1,550	5.5	1,538	5.7
Service	9,281	47.3	10,725	49.1	13,891	52.2	15,872	56.5	15,060	56.2

Note: NACE Rev. 2 is considered for classification of Economic Activities.

Source: TURKSTAT, Labor Force Statistics, http://www.tuik.gov.tr/UstMenu.do?metod=temelist Note: 2005-2013 results are estimated by econometric model.

2.3- Sectoral Distribution of Gross Domestic Product

D P **S** I R

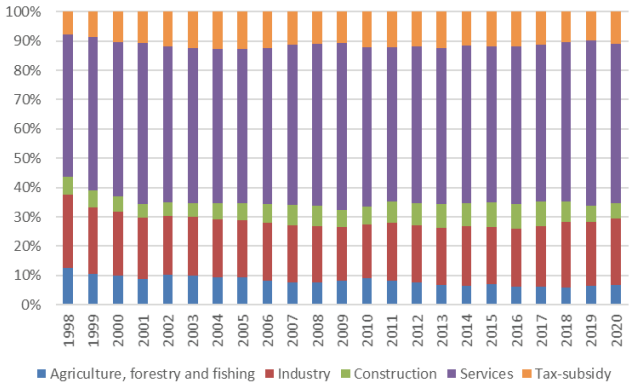
This indicator is a state indicator and shows the contribution of the agriculture, industry, construction and services sectors to GDP. The indicator shows the percentage share of the economic activity branches in the gross domestic product (consumer prices) in current prices.

GDP at current prices according to the production method increased by 16.9% compared to the previous year and reached 5 trillion 46 billion 883 million TL in 2020 according to TURKSTAT data. The sector activities that make up the GDP at current prices were 4,486,655,613 TL excluding taxes and subsidies in 2020. When they are

analyzed, the share of agriculture, forestry and fisheries sector was 7.5%, the share of the industrial sector was 25.6%, the share of the construction sector was 5.9% and the share of the services sector was 61%.

Looking at the distribution of gross value added by economic activity in the EU-27 countries in 2020, the share of agriculture, forestry and fisheries sectors was 1.8%, the share of the industrial sector was 19.5%, the share of the construction sector was 5.6% and the share of the services sector was 73.1%[9].

GRAPH 9- GROSS DOMESTIC PRODUCT AT CURRENT PRICES BY ECONOMIC ACTIVITIES (A21) (%)



Source: TURKSTAT, 2021

Notes:

1) Figures may not add up due to rounding.

2) NACE Rev. 2 used for classification of Economic Activities.

2.4- Environmental Protection Expenditure

D P S I R

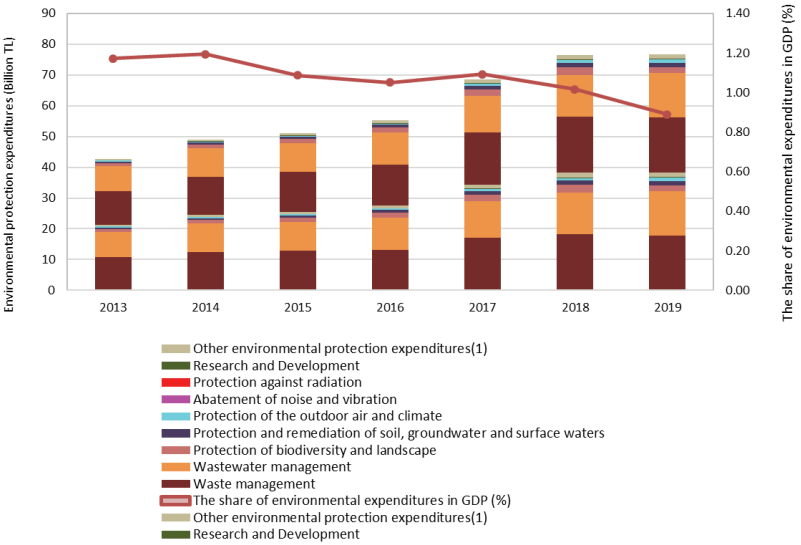
Total environmental production expenditures are directly related to countries' environmental performance and economic prosperity. Environmental expenditures appear as a response indicator for the protection of environmental values.

Environmental protection expenditures increased by 1.2% in 2019 compared to the previous year, reaching a total of 38.4 billion TL. 57.8% of environmental protection expenditures were made by financial and non-financial companies, 34.2% by general government and non-profit organizations serving households, and 8% by households.

Of the environmental protection expenditure, 46.3% was spent on waste management, 37.8% on wastewater management, 4.8% on biodiversity and landscape conservation, 3.8% on soil, underground and surface water protection and water quality improvement, and 7.3% on other environmental protection expenditure[10].

In the EU-27 countries, private and public expenditures on environmental protection as a percentage of gross domestic product was 2.0% in 2020[11].

GRAPH 10- ENVIRONMENTAL PROTECTION EXPENDITURE BY DOMAINS, (2013-2019)



Source: TURKSTAT, "Environmental Protection Expenditure Statistics, 2019"

(1) Includes environmental education activities, indivisible activities, and activities not otherwise specified.

3 HEALTH

3.1- Life Expectancy at Birth

D P **S** I R

Life expectancy at birth is an indicator of socioeconomic status and quality of life in countries. It is used to compare the mortality rates of countries and measure their level of development. This indicator depends on the efficiency of health services as well as socioeconomic conditions and living conditions. Life expectancy is generally higher in more developed countries. The life expectancy of women is generally higher than that of men.

According to data from TURKSTAT, life expectancy at birth in Turkey increased from 78 years in 2013-2015 to 78,6 years in 2017-2019. According to data from TURKSTAT, life expectancy at birth in 2017-2019 is 75.9 years for men and 81.3 years for women. In general, women live longer than men, and the difference in life expectancy at birth is 5.4 years[12]. According to the 2019 data, Hong Kong (85 years), Japan (84 years), and Switzerland (83 years) are among the countries with the highest life expectancy at birth. Turkey ranks 64th with a life expectancy at birth of 78.6 years in 2019, according to population projections and forecasts from TURKSTAT[13].

The average life expectancy at birth in EU-27 countries was 81.3 in total (78.5 for males and 84 years for females) according to 2018 European Union Statistics Office (EUROSTAT) data[14].

TABLE 4- LIFE EXPECTANCY BY SEX AND AGE (YEAR)

Period	Total	Man	Woman
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

Source: TURKSTAT, 2021

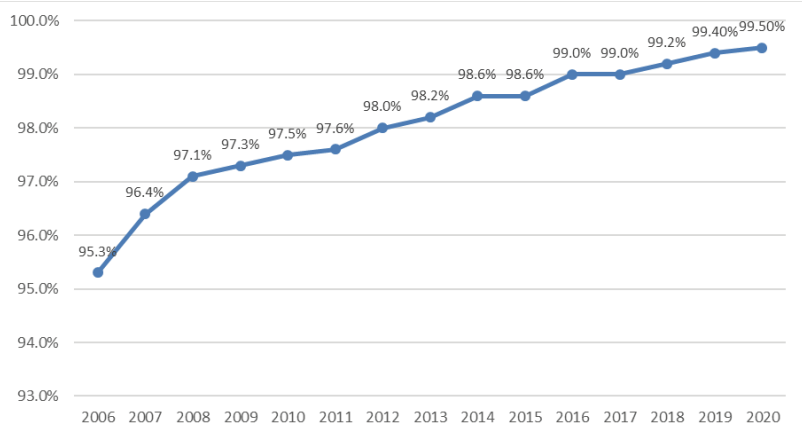
3.2- Safe Drinking Water Access Rate

D P S I R

Lack of access to safe drinking water is a major cause of disease and death due to infectious substances, chemical pollutants, and poor sanitation. The supply of water through pipes to the inside of the house is called the piped water system in the urban water supply.

95.3% of the non-institutional population in Turkey benefited from the piped water system in 2006, while this percentage was 99.5% in 2020, according to TURKSTAT data[15]. Non-institutional population refers to all individuals living in households within the borders of the Republic of Turkey. It does not include those living in schools, dormitories, hotels, kindergartens, nursing homes, hospitals and prisons, as well as those living in barracks and army houses.

GRAPH 11– NON-CORPORATE POPULATION RATE ACCORDING TO BEING OWNERSHIP OF THE PIPED WATER SYSTEM (2006-2020)



Source: TURKSTAT, Income and Living Conditions Survey, 2020

4

CLIMATE CHANGE

4.1- Greenhouse Gas Emissions

D P S I R

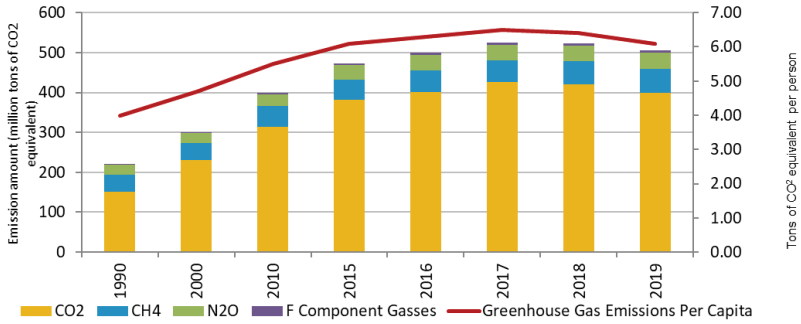
Greenhouse gas emissions are indicators of pressure. They are important for Turkey's contribution to climate change and the distribution of this contribution by source, as well as for monitoring and controlling emissions.

Total greenhouse gas emissions (CO_2-equivalent) in 2019 increased by 130.5% compared to 1990.

According to the results of the greenhouse gas inventory, total greenhouse gas emissions in 2019 decreased by 3.1% compared to the previous year and were calculated at 506.1 million tons (Mt) of CO_2 equivalent (eq). Total GHG emissions per capita in Turkey were calculated at 4 tons of CO_2 equivalent in 1990, 6.4 tons of CO_2 equivalent in 2018, and 6.1 Mt CO_2 equivalent in 2019[16].

In 2019, greenhouse gas emissions in the EU-28 decreased by 24% compared to 1990[17]. In 2019, EU-28 per capita emissions in CO_2 equivalents are 8.2 tonnes/person[18].

GRAPH 12- GREENHOUSE GAS EMISSIONS TREND OVER THE YEARS



Source: TURKSTAT, Greenhouse Gas Emissions Statistics,1990-2019

TABLE 5- GREENHOUSE GAS EMISSIONS OVER THE YEARS (million tons of CO_2 equivalent)

	1990	2000	2010	2015	2016	2017	2018	2019
CO_2	151.5	229.8	314.4	381.3	401.2	425.3	419.2	399.3
CH_4	42.4	43.6	51.3	51.3	53.9	54.2	57.6	60.3
N_2O	24.7	24.8	29.4	34.7	37.1	38.5	38.9	40.2
F Component Gases	0.6	0.7	3,5	4.8	6.3	8.2	5.2	6.2
Total	219.2	298.9	398.7	472.2	498.5	526.3	520.9	506.1

Source: TURKSTAT, Greenhouse Gas Emissions Statistics,1990- 2019
Notes:
(1) Data for 1990-2019 have been revised in the table.
(2) Emissions and sinks from forestry and other land use are not included.

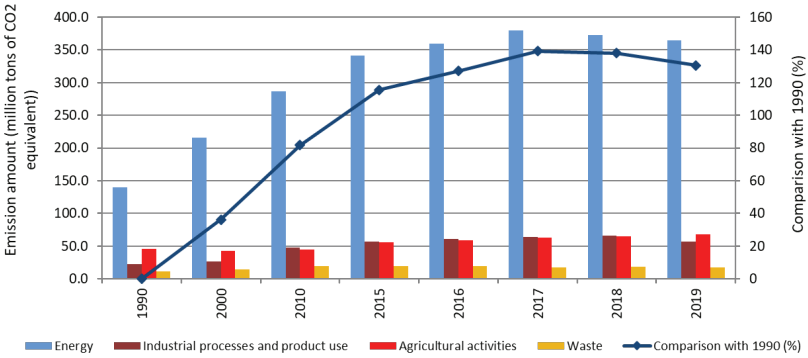
4.2- Total Greenhouse Gas Emissions by Sectors

D P S I R

Looking at the sectoral distribution of greenhouse gas emissions in Turkey over the years, the increase in total emissions is mainly observed in energy production and consumption. In 2019, the largest share of CO_2 equivalents in total GHG emissions at 72%, followed by agriculture at 13.4%, industrial processes and product use at 11.2%, and the waste sector at 3.4%.Emissions from the energy sector increased by 161% in 2019 compared to 1990 and decreased by 2.3% compared to the previous year, and were calculated at 364.4 Mt CO_2 eq. Emissions from industrial processes and product use increased by 147.1% compared to 1990 and decreased by 14.3% compared to the previous year and were calculated at 56.4 million t CO_2 eq. Emissions from the agricultural sector were calculated at 68 million t CO_2 eq in 2019, up 47.7% from 1990 and 4.1% from the previous year. Waste emissions, on the other hand, increased by 55.7% compared to 1990 and decreased by 5% compared to the previous year, and were calculated at 17.2 million t CO_2 eq[19].

"Combustion of fuels and fugitive emissions from fuels (excluding transport)" accounted for 53% of EU-28 GHG emissions in 2018. Transport (including international aviation) was the second most important resource sector, with 25% in 2018. GHG emissions from agriculture contribute 10%, industrial production and product use 9%, and waste management 3% of total EU-28 GHG emissions[20].

GRAPH 13- TOTAL GREENHOUSE GAS EMISSION DISTRIBUTION BY SECTORS OVER THE YEARS



Source: TURKSTAT, Greenhouse Gas Emissions Statistics,1990-2019

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

(million tons of CO_2 equivalent)

Years	1990	1995	2000	2005	2010	2014	2015	2016	2017	2018	2019
Energy	139.6	166.3	216.1	244.0	287.0	325.8	340.9	359.7	379.9	373.1	364.4
Industrial process and product use	22.8	25.2	26.2	33.6	48.1	58.6	57.1	61.1	63.6	65.2	56.4
Agricultural activities	45.7	43.7	42.3	42.3	44.0	55.9	55.8	58.5	62.8	64.9	68.0
Waste	11.1	12.4	14.3	17.3	19.5	18.2	18.8	18.4	17.4	17.8	17.2
Comparison with 1990 (%)	-	12.95	36.35	53.84	81.87	108.9	115.5	126.9	138.8	137.5	130.5

Source: TURKSTAT, Greenhouse Gas Emissions Statistics,1990- 2019

Notes: (1) Data for 1990-2019 have been revised in the table.

(2) Emissions and sinks from forestry and other land use are not included.

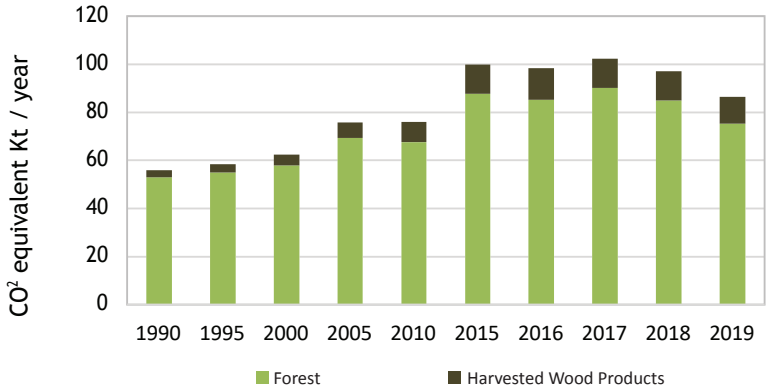
4.3- Carbon Sinks and Capture

D P S I R

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

In 2019, 75 million tons of CO_2 equivalent were captured in our forests and 11 million tons of CO_2 equivalent were captured in processed wood products. 2 million tons of CO_2 equivalent emissions were released in the LULUCF sector. Thus, the net carbon capture of the LULUCF sector is 84 million metric tons of CO_2 equivalent. This represents a 47 percent increase compared to 1990, with sustainable land use, forest management, afforestation studies, and land restoration and rehabilitation being the main drivers[21], [22].

GRAPH 14- CARBON SINK AREAS AND CARBON CAPTURES IN TURKEY (1990-2019) (CO_2 equivalent Kt / year)



Source: Turkey National Inventory Greenhouse Gas Inventory Report (NIR), LULUCF Section, 2021 (https://unfccc.int/documents/271544)

TABLE 7- CARBON SINK AREAS AND CAPTURES IN TURKEY (CO_2 equivalent Kt / year)

Years	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019
Forests	52.82	54.96	57.89	69.35	67.61	87.66	85.23	90.19	84.84	75.31
Harvested Wood Products	2.95	3.33	4.3	6.37	8.33	12.2	13	12.11	12.13	11.18
TOTAL	55.77	58.29	62.19	75.73	75.94	99.86	98.23	102.3	96.96	83.99

Source: Turkey National Inventory Greenhouse Gas Inventory Report (NIR), LULUCF Section, 2021, (https://unfccc.int/documents/271544)

4.4- Consumption of Ozone-Depleting Substances (ODS)

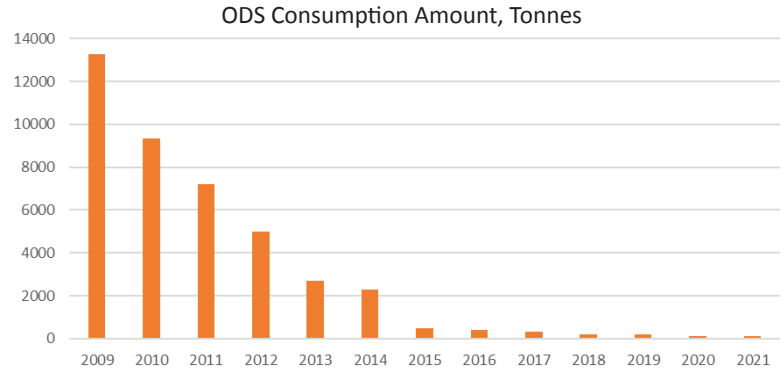
D P S I R

The indicator is a driving force indicator. The ozone layer absorbs almost all harmful ultraviolet (UV) rays from the sun that reach the earth in the stratospheric layer and protects living beings and the environment from harmful ultraviolet (UV) rays. However, the release of ozone-depleting substances (ODS) into the atmosphere is thinning the ozone layer.

Chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), halon, carbon tetrachloride, and methyl chloroform are ozone-depleting substances and are used in areas that occupy an important place in our daily lives, such as refrigerators, air conditioners, and fire extinguishers.

Turkey became a party to the Montreal Protocol on Substances that Deplete the Ozone Layer (ODS) in 1991 and has accepted all its amendments. It is one of the developing countries of the Protocol (referred to as Group A5 countries in the Protocol). The import and consumption of ODS not produced in our country will be phased out in accordance with the Protocol commitments. Projects and activities are carried out to raise public and sector awareness on the transition to ODS alternative substances. Turkey is carrying out successful activities by implementing a faster ODS phase-out schedule than other developing countries. The use of substances that deplete the ozone layer has decreased by 99% in Turkey between 2009 and 2021. Globally, the worldwide consumption of ozone-depleting substances under the Montreal Protocol has decreased by 98.5% between 1986 and 2021[23].

GRAPH 15- OZONE-DEPLETING SUBSTANCES (ODS) CONSUMPTION IN TURKEY



Source: The Ministry of Environment, Urbanisation and Climate Change, General Directorate of Environmental Management, 2021

4.5- Precipitation

D P S I R

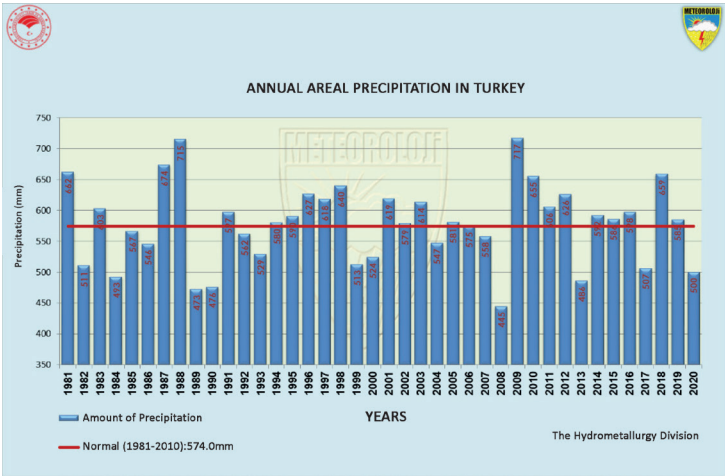
The indicator is an impact indicator and expresses the average amount of precipitation per unit area in a time series.

The annual precipitation per unit area in our country is about 574 mm. In 2020 (01 January–31 December), an average precipitation of 500 mm was recorded. Annual precipitation nationwide was down 12.9% from normal and 14.5% from the previous year. 2008 was the driest year in the last 40 years, and 2020 was the sixth year with the lowest precipitation.

In 2020, more than 1000 mm of precipitation fell in the coastal areas of Rize and Artvin from the eastern parts of Giresun and Trabzon, while the precipitation in all of Central Anatolia, Denizli, Afyonkarahisar, Gümüşhane, north of Erzurum, Şanlıurfa, south of Gaziantep, western parts of Malatya, east of Van and Ağrı, and Iğdır were between 200 and 400 mm. As for the precipitation in the whole province, Kırıkkale received the least with 272 mm and Rize received the most with 1710 mm. The provinces of Amasya, Çorum, Kırıkkale and Kırşehir provinces received the least precipitation in the last 40 years.

As for extreme precipitation, 2020 was a year of precipitation records. The highest precipitation in one day was 272.6 mm in Rize Çayeli Bakır İşletmeleri on 14.07.2020. It was calculated that the repetition period of the current precipitation is more than 200 years, and at the same time this amount of precipitation was registered as the new daily maximum precipitation record in Turkey for the month of July[24].

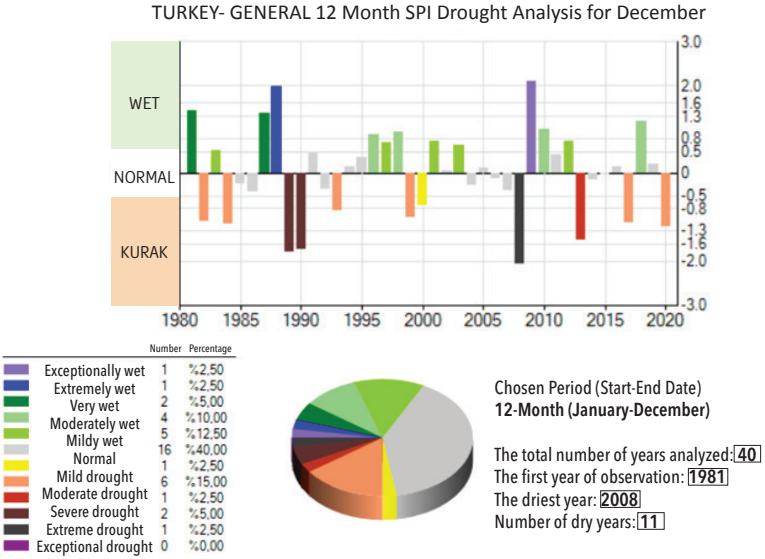
GRAPH 16- ANNUAL AREAL PRECIPITATION IN TURKEY (mm)



Source: The Ministry of Environment, Urbanisation and Climate Change, Turkish State Meteorological Service; 2021

According to the drought analysis performed with the SPI method for Turkey in general between 1981 and 2020, the number of dry years under 40 years is 11. The year 2008 was the driest year on record, and this year was exceptionally dry. 16 years were normal and 13 years were wet. 2009 was the wettest year on record with exceptional moisture. The year 2020 was moderately dry[25].

GRAPH 17- GENERAL DROUGHT ANALYSIS IN TURKEY BETWEEN 1981-2020



Source: The Ministry of Environment, Urbanisation and Climate Change, Turkish State Meteorological Service; 2021

4.6- Temperature

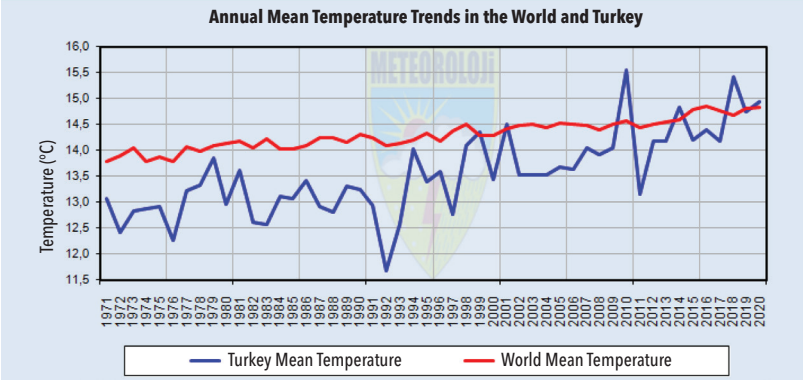
D P **S** I R

The indicator is a status indicator and shows the annual mean temperature change in Turkey and the world.

In 2020, the global mean temperature of oceans and lands was 14.84 °C, 0.54 °C higher than the 1981-2010 average (14.30 °C). Annual mean temperatures for Turkey in 2020 were 14.9 °C, 1.4 °C above the 1981-2010 average (13.5 °C). The lowest temperature in 2020 was recorded in Erzurum with -31.9 °C in February, and the highest temperature was recorded in Cizre with 47.3 °C in July.

Looking at the period 1971-2020, the highest annual mean temperature in Turkey was 15.5 °C in 2010, and the lowest annual mean temperature was 11.7 °C in 1992. There have been positive temperature anomalies in Turkey since 1994 (except 1997 and 2011) [26].

GRAPH 18- ANNUAL MEAN TEMPERATURE TRENDS IN THE WORLD AND TURKEY



Sources:

For World data; National Oceanic and Atmospheric Administration/ U.S. Department of Commerce (NOAA).

For Turkey data; The Ministry of Environment, Urbanisation and Climate Change, Turkish State Meteorological Service; 2021.

4.7- Sea Surface Temperature

D P S I R

The indicator is an impact indicator and expresses the annual change in sea surface temperature.

The main source of weather events and air masses in the atmosphere are the oceans and seas. The most accurate indicator of climate change is the warming and cooling of the sea surface. Warming or cooling of the sea surface affects many living organisms by changing the ecological structure of the oceans, and it is closely linked to an important group that benefits economically from the oceans.

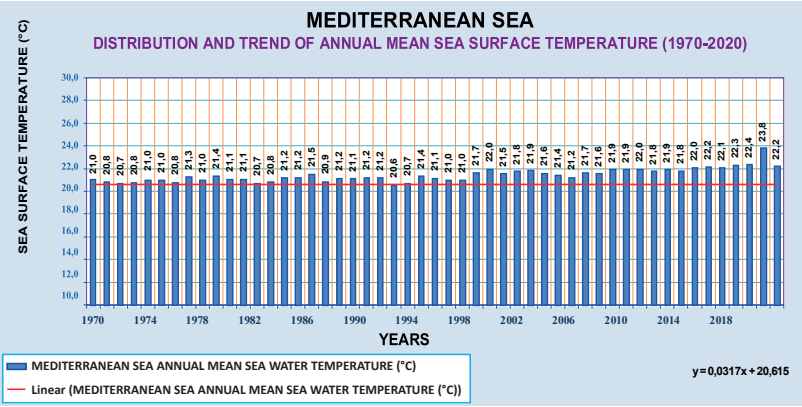
Sea surface temperature is a meteorological parameter that is not directly affected by atmospheric warming and cooling, as is the case with air temperature. In addition, the sea warms more slowly than the land and cools more slowly, so its temperature does not change so suddenly during the day. The main factors affecting sea surface temperature are latitude, salinity, cold water currents, and the wind direction that prevails during the day.

According to data from the Turkish State Meteorological Service, although there has been a slight increase in mean sea surface temperatures in Turkey for many years,

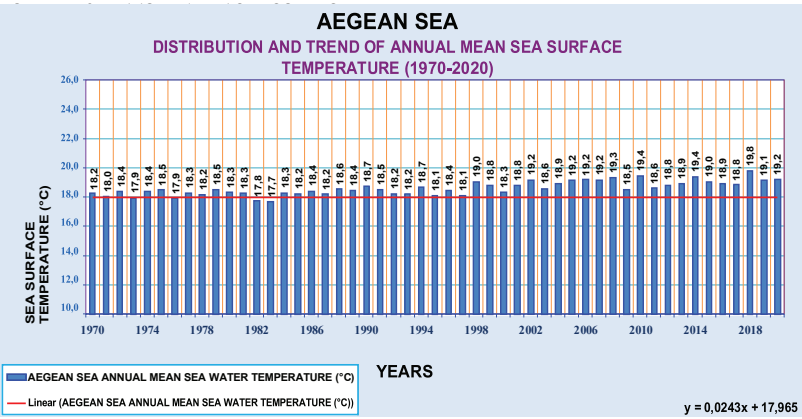
there can be no talk of global warming yet. The Turkish State Meteorological Service is continuing its studies to measure sea surface temperature on all our coasts and seas to monitor this process. This will provide a higher resolution data source on our seas.

Mean sea surface temperatures in 2020 were 22.2 °C in the Mediterranean Sea, 19.2 °C in the Aegean Sea, 18.0 °C in the Sea of Marmara, and 16.3 °C in the Black Sea. The charts below show the annual mean sea surface temperatures (°C) measured in the seas between 1970 and 2020[27].

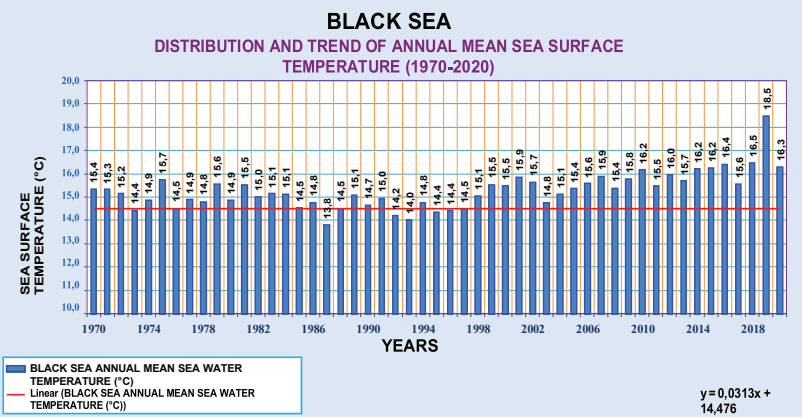
GRAFİK 19- ANNUAL MEAN SEA SURFACE TEMPERATURES MEASURED IN THE MEDITERRANEAN SEA(°C)



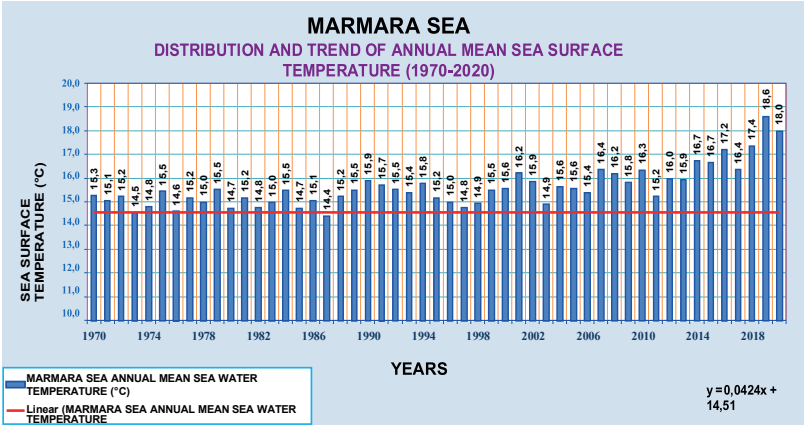
GRAPH 20- ANNUAL MEAN SEA SURFACE TEMPERATURES IN THE AEGEAN SEA (°C)



GRAPH 21- ANNUAL MEAN SEA SURFACE TEMPERATURES IN THE BLACK SEA (°C)



GRAPH 22- ANNUAL MEAN SEA SURFACE TEMPERATURES IN THE SEA OF MARMARA (°C)



Source: The Ministry of Environment, Urbanisation and Climate Change, Turkish State Meteorological Service; 2021

4.8-Heating and Cooling Day-Degrees

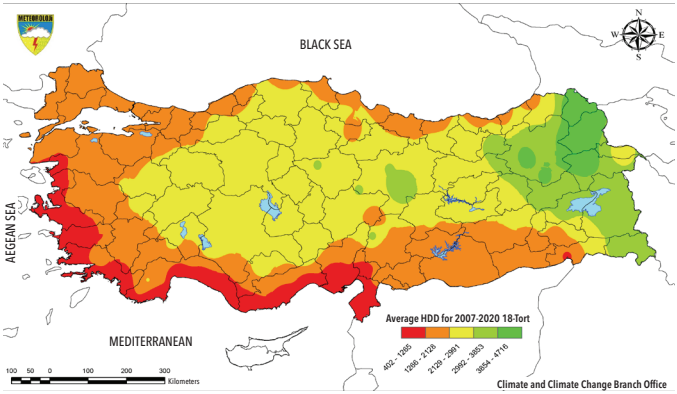
D P S I R

The number of heating and cooling degree-days is an impact indicator, and it is important to know the total number to understand the energy required to heat or cool buildings. If the outdoor air temperature is above 15 °C, heating is unnecessary. Heating

costs are directly proportional to annual Heating Degree Days (HDD). HDD is also used to compare winter severity to previous and long years.

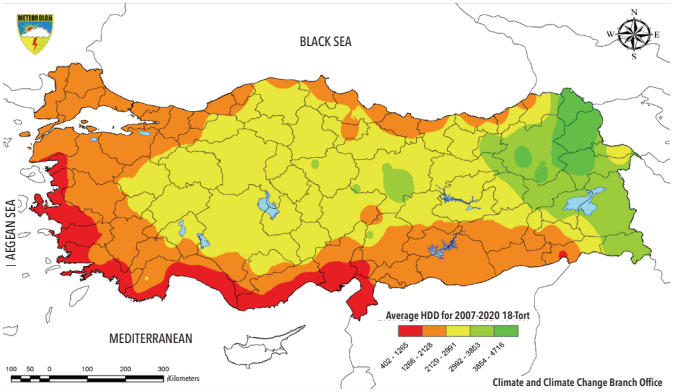
If the heating and cooling day-degrees in Turkey are considered for 129 stations in Turkey; while the Heating Day-Degrees for many years (2007-2020) are 2041 Day-Degrees, the Cooling Day-Degrees are 362 Day-Degrees[28].

MAP 1- AVERAGE HEATING DAY-DEGREES FOR 2007-2020 IN TURKEY



Source: The Ministry of Environment, Urbanisation and Climate Change, Turkish State Meteorological Service; 2021

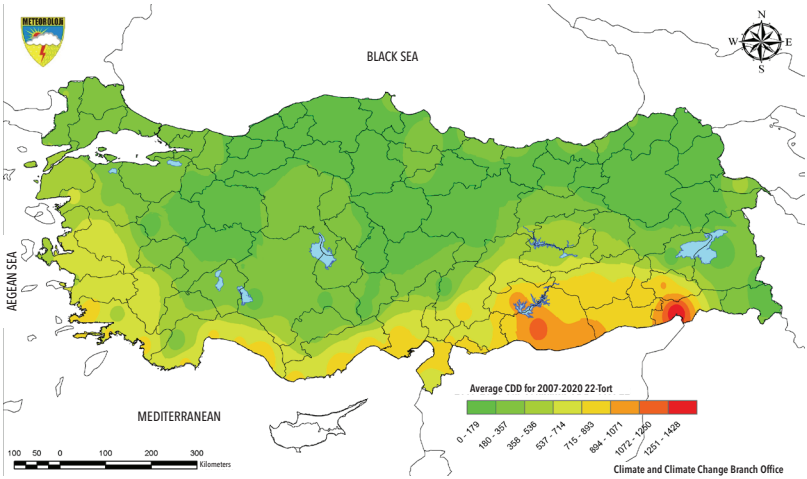
MAP 2- TÜRKİYE 2020 YILI ISITMA GÜN-DERECELERİ



Source: The Ministry of Environment, Urbanisation and Climate Change, Turkish State Meteorological Service; 2021

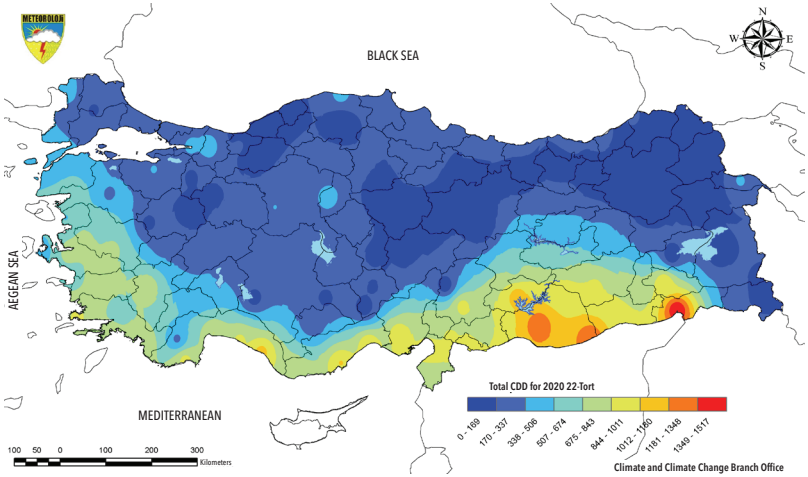
While the average Heating Day-Degrees in 2020 in 129 centers in Turkey were 1947 Day-Degrees, the Cooling Day-Degrees was realized with 404 Day-Degrees[29].

MAP 3- AVERAGE COOLING DAY-DEGREES FOR 2007-2020 IN TURKEY



Source: The Ministry of Environment, Urbanisation and Climate Change, Turkish State Meteorological Service; 2021

MAP 4- COOLING DAY-DEGREES FOR 2020 IN TURKEY



Source: The Ministry of Environment, Urbanisation and Climate Change, Turkish State Meteorological Service; 2021

Analyzing the situation in Europe (EU-28 excluding Cyprus, Liechtenstein, Norway and Switzerland), we find that annual population-weighted heating day degrees (HDD) decreased by 6% between the periods 1950-1980 and 1981-2017. Annual population-

weighted cooling day degrees (CDD) increased by 33% between the periods 1950-1980 and 1981-2017[30].

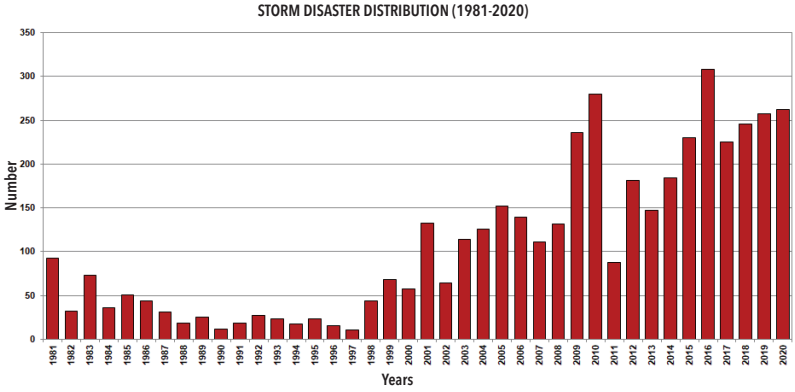
4.9- Number of Storm Disasters

D P S I R

This indicator is an impact indicator and shows the change in the number of storm disasters that occurred in Turkey between 1981 and 2020 according to the records of the Turkish State Meteorological Service.

Storm disasters are a type of disasters that can be observed almost everywhere in Turkey. It can be observed that the number of storm disasters in Turkey is increasing especially since 2000s. The highest number of storm disasters was recorded in 2016. Among the storm disasters in the last 10 years, 2020 was the third year with the highest number of storm disasters[31].

GRAPH 23- YEARS DISTRIBUTION OF TOTAL STORM DISASTER OCCURRED ACROSS TURKEY BETWEEN 1981-2020



Source: The Ministry of Environment, Urbanisation and Climate Change, Turkish State Meteorological Service; 2021

5 AIR POLLUTION

5.1- Air Pollutant Emissions

D P S I R

Air pollutant emissions are important indicators of the pressure affecting air pollution. It contains national emission levels of major air pollutants by year and source sector.

The Ministry of Environment, Urbanisation and Climate Change run the studies within the scope of the "Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP)" of the United Nations Economic Commission for Europe (UNECE) "Convention on Long-Range Transboundary Air Pollution (CLRTAP)".

A national inventory of air pollutant emissions is compiled annually and reported through the European Environment Information and Observation Network (EIONET) in conjunction with the UNECE Secretariat. The first reporting was done in 2010, and improvements are made annually. Emission calculations were performed using emission factors taken from the internationally accepted guidance.

UN-ECE The Convention on Long-Range Transboundary Air Pollution - CLRTAP - entered into force on 13.11.1979 and Turkey became a Party on 18.04.1983. 51 countries are parties to the Convention and the Secretariat of the Convention is run by the UN-ECE.

The contract has 8 protocols. The only protocol to which our country became a party to on 20.12.1985, is the "Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe (EMEP)." The main objective of this protocol is to collect the air pollutant emission inventory 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.

The following studies were conducted under the Convention on Long-Range Transmission of Air Pollutants:

- As part of our responsibilities under the EMEP Protocol, emissions inventory reporting has been done regularly since 2011 in the form of a time series that is two years behind the current calendar year, in accordance with the rules of the Protocol.

- The Informative Inventory Report (IIR), which should be prepared as part of the emissions inventory data, is submitted annually, for the first time in 2012.
- The regular meeting of the Task Force on Emission Inventories and Projections was held in Istanbul in 2013, hosted by our country. At this meeting, our reporting was awarded the "Best Developed Inventory in the Last Three Years" prize. The 2015 annual meeting was held in Italy. Our reporting on the inventory was awarded in the category "Significant Progress".

The pollutants that form the basis for reporting are NO_X (nitrogen oxides), SO_2 (sulphur dioxide), NMVOC (non-methane volatile organic compounds), NH_3 (ammonia), PM_{10} (particulate matter), $PM_{2.5}$ (fine particulate matter), CO (carbon monoxide), and each addition is made as necessary improvements are made throughout the year.

Looking at the situation of emissions for the years 1990 to 2019 covered by the reporting based on the year 2021 in the graph, the national emission totals for the year 2019 are as follows: 779 kt for NO_X, 1121 kt for NMVOC, 2455 kt for SO_X, 765 kt for NH_3, 249 kt for PM10 and 1663 kt for CO. In this context, our country's share of air pollution from SO_X emissions is almost 60% if all EMEP countries are taken into account, and it is important to prioritize efforts to improve polluting sectors of the Energy Industry and Domestic Facilities[32].

When analyzing emissions compared to 2018, it can be seen that NH_3, CO, PM10, and NMVOC emissions increased by 5%, 4.5%, 3%, and 3%, respectively, while SO_2 and NO_X emissions decreased by 2.5% and 0.7%, respectively. The table shows the emission changes as a function of time series and compared to the previous year[33].

Of national emissions in 2019, 75% of SO_2 emissions are from energy industry and 8% are from domestic facilities. 44% of NO_X emissions originated from the energy industry. 22% of NMVOC emissions originated from the livestock industry. The main source of NH_3 emissions is the fertilizer management.

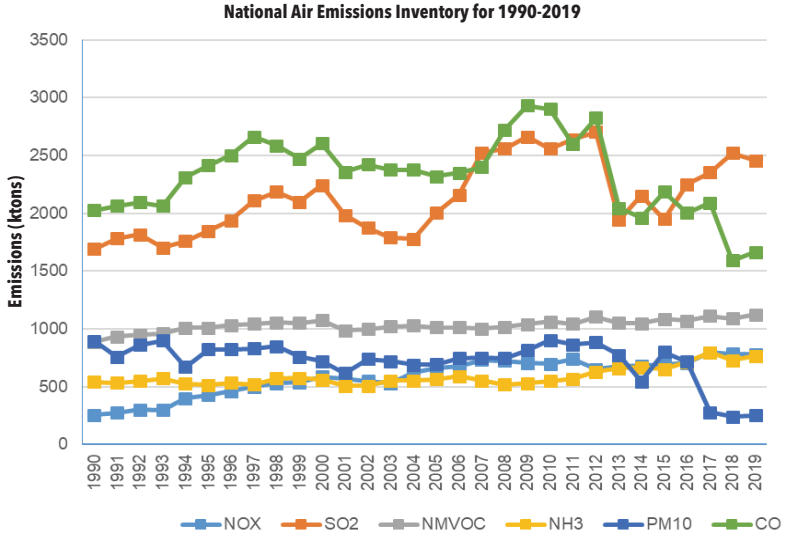
TABLE 8- EMISSION-CHANGE TRENDS FOR SO_2, NO_X, NMVOC, NH_3, CO AND PM_{10}

Change by Years (%)	SO_2	NO_X	NMVOC	NH_3	CO	PM_{10}
Trend (1990-2019)	45	205	26	31	-18	-9
Trend (2018-2019)	-2,5	-0,7	3	5	4,5	3

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

Between 2005 and 2019, the four emissions of these pollutants decreased as follows: SO_x emissions by 76%, NO_x emissions by 29%, NMVOC emissions by 42%, and NH_3 emissions by 8% in the EU-27 Member States[34].

GRAPH 24- EMISSION TOTALS FOR SO_2, NOX, NMVOC, NH_3, CO, and PM_{10} (1990-2019)



Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Environmental Management, 2020

5.2- Large Combustion Plants

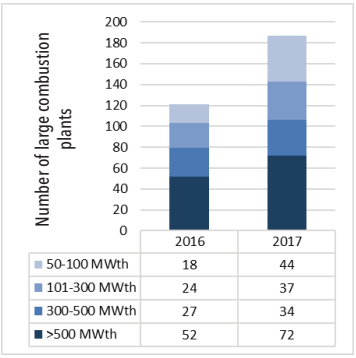
D P S I R

This indicator is an important pressure indicator that affects air pollution. Large combustion plants consume large amounts of fuels, mostly fossil fuels, to produce useful energy, as they are plants with a nominal thermal power of 50 MW or more. Emissions from large combustion plants account for a large portion of total man-made pollutant and greenhouse gas emissions. The goal of related legislation is to reduce emissions of acidifying pollutants, particulate matter, and ozone precursors. More effective pollution reduction requires a systematic transition to low-carbon and cleaner alternatives in energy generation[35].

The total thermal capacity of the Large Combustion Plants in Turkey was 82 GWth in 2016 and it increased by 42% to 125 GWth in 2017[36].

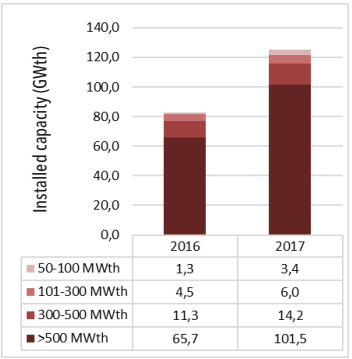
Total installed capacity in EU-28 countries was 1287 GWth in 2017. There has been a decrease in the total fuel consumption in combustion plants as a result of European Union policies on air quality, public health, and climate change. More effective measures are expected to be taken under the New Green Consensus to achieve zero pollution and decarbonization targets, and to replace fossil fuels with renewable resources[37].

GRAPH 25- NUMBER OF LARGE COMBUSTION PLANTS



	2016	2017
50-100 MWth	18	44
101-300 MWth	24	37
300-500 MWth	27	34
>500 MWth	52	72

GRAPH 26- LARGE COMBUSTION PLANTS TOTAL THERMAL POWER



	2016	2017
50-100 MWth	1,3	3,4
101-300 MWth	4,5	6,0
300-500 MWth	11,3	14,2
>500 MWth	65,7	101,5

Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Environmental Management, 2020

5.3- Average Concentrations of PM_{10} and SO_2 in Ambient Air

D P **S** I R

The concentration of pollutants in the ambient air is a major state indicator regarding air pollution. Therefore, data from air quality monitoring stations established in 81 provinces under the "National Air Quality Monitoring Network" is collected and made available to the public at www.havaizleme.gov.tr.

The annual average data for PM_{10} and SO_2 measured and verified at the 10 stations with the highest pollution in 2020 are shown in Table 9 according to the information provided by the National Air Quality Monitoring Network. Hakkari has the highest SO_2 annual average for the year 2020. Muş station is considered as the station with the highest PM_{10} annual average in 2018.

When the last five-year period between 2016 and 2020 is analyzed, it is seen that Bursa, Iğdır, Adana and Şırnak stations entered the top 10 of the stations with the

highest annual PM_{10} averages 3 times, and that Edirne entered the top 10 of the stations with the highest annual SO_2 averages 5 times, and Trabzon station entered that 3 times.

TABLE 9- AIR QUALITY MONITORING STATIONS WITH THE HIGHEST PM_{10} and SO_2 AVERAGES FOR 2020

Station Name	PM_{10} ($\mu g/m^3$)*	Station Name	SO_2 ($\mu g/m^3$)*
MUŞ	109	HAKKARİ	175
BATMAN	102	MANİSA SOMA	101
ANKARA CEBECİ	92	EDİRNE KEŞAN	69
IĞDIR	91	ŞIRNAK	38
DÜZCE	75	ŞANLIURFA	37
İÇEL	74	TUNCELİ	29
KİLİS	73	ORDU	27
KAYSERİ OSB	72	BİTLİS	26
DENİZLİ BAYRAMYERİ	71	MUĞLA	23
ŞIRNAK	70	KAHRAMANMARAŞ	22

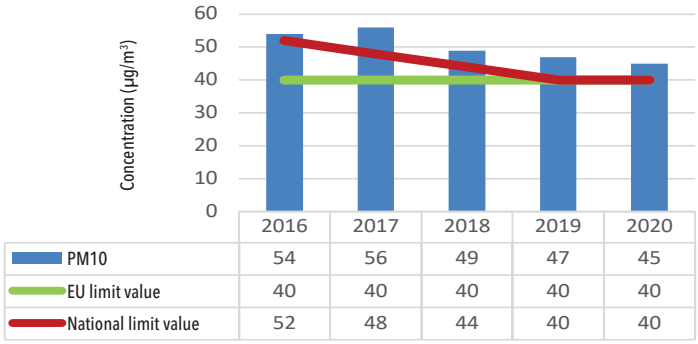
* Evaluated on the basis of validated hourly average values taken from the stations, where data availability is 90% and above.

MCAC: Marmara Clean Air Center

Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of EIA, Permitting and Inspection, Depart¬ment of Laboratory, Measurement and Monitoring, 2021

Graph 27 shows the average PM_{10} concentrations of PM_{10} for the last five years. According to this, the national limit value and the European Union limit value were exceeded by 11% in 2020.

GRAPH 27- AVERAGE PM_{10} CONCENTRATIONS OF THE LAST FIVE YEARS (2014-2020)



	2016	2017	2018	2019	2020
PM10	54	56	49	47	45
EU limit value	40	40	40	40	40
National limit value	52	48	44	40	40

Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of EIA, Permitting and Inspection, Depart¬ment of Laboratory, Measurement and Monitoring, 2021

As part of "Clean Air Action Plans" to improve air quality, necessary studies have been and are being conducted to increase the efficiency of measures to control the type of fuel used for heating, improve combustion systems, sheath buildings, train firefighters, and reduce pollution caused by motor vehicles. Local governments as well as the Ministry of Environment, Urbanization and Climate Change and provincial directorates are continuing their studies to combat air pollution.

5.4- Number of Exceedances of Air Quality Limit Values

D P **S** I R

This is a status indicator that shows how often air pollution exceeds (daily) limits. An increasing number of exceedances indicates a deterioration in air quality.

In the By-law on Air Quality Assessment and Management (BAQAM), a stricter limit value with a gradual reduction for air quality parameters has been applied every year since 2009. The slightly greater reduction of the limits set in BAQAM each year and the continuous increase in the number of monitoring stations have an impact on the increase in the total number of exceedances.

The daily limit value was determined as 50 µg/m^3 for the PM10 parameter and 125 µg/m^3 for the SO_2 parameter in 2020. The total number of exceedances was 17601 for the PM_{10} parameter and 350 for the SO_2 parameter in 2020[38].

5.5- Number of Air Quality Monitoring Stations

D P S I **R**

The indicator is a response indicator and monitors the number and qualification of monitoring stations to ensure more reliable air quality data.

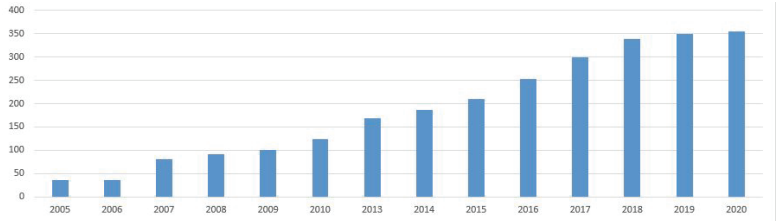
The 355 stations that have been established in our country have been classified according to the standards of the European Union, both by source and by area. The preliminary air quality assessment studies conducted by our Ministry were used in the establishment of the stations.

Among the existing stations, PM_{10} parameters are measured in 335, $PM_{2.5}$ in 165, SO_2 in 302, NO_X in 294, O3 in 210, and CO in 186 stations[39].

Considering the population data that are relevant for determining the number of stations to be established according to the European Union standards, the number of

existing stations should be at least 350. In this regard, the number of existing stations, according to the latest status of our Ministry, is 355.

GRAPH 28- NUMBER OF AIR QUALITY MONITORING STATIONS THROUGH THE YEARS



2005	2006	2007	2008	2009	2010	2013	2014	2015	2016	2017	2018	2019	2020
36	36	81	92	100	123	169	186	210	253	300	339	350	355

Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of EIA, Permitting and Inspection, Depart¬ment of Laboratory, Measurement and Monitoring, 2021

6

WATER-WASTEWATER

6.1- Use of Freshwater Resources

D P S I R

The indicator is a pressure indicator. It shows the use of freshwater resources (surface and groundwater) to meet the demand for drinking water and the water needs of industry and agriculture. Water consumption is the indicator of the pressure on freshwater bodies.

According to the DSI data, the sectoral water consumption for 2020 is 44 billion $m^3$for irrigation (76.8%), 13.30 billion m^3 (23.2%) for drinking water supply, use and industry, and the total water consumption (40.7 billion m^3 above ground, 16.60 billion m^3 and groundwater use) is 57.30 billion m^3[40].

Based on TURKSTAT data, in 2018, 17.5 billion m^3 of water was abstracted from water resources and distributed through potable/service water networks in municipalities and villages for use by manufacturing industry workplaces, thermal power plants, Organized Industrial Zones (OIZs), and mining companies. Of this, 9.5 billion m^3 of this amount was abstracted for cooling purposes. In 2020, a total of 18.2 billion m^3 of water was abstracted from water resources, of which 9.8 billion m^3 was abstracted for cooling purposes[41].

TABLE 10- AMOUNT OF WATER ABSTRACTED FROM WATER RESOURCES ACCORDING TO ITS USAGE (billion m^3/year)

Years	2008	2010	2012	2014	2016	2018	2020
Municipalities	4.55	4.78	4.94	5.23	5.83	6.19	6.49
Villages	1.22	1.01	1.04	0.43	0.38	0.39	0.42
Manufacturing Industry Workplaces	1.31	1.56	1.79	2.20	2.12	2.68	2.60
Thermal Power Plants	4.54	4.27	6.40	6.53	8.61	7.87	8.28
Organized Industrial Zones	0.11	0.11	0.14	0.14	0.15	0.16	0.18
Mining Facilities	... (*)	0.05	0.11	0.21	0.23	0.24	0.27
Irrigation	33.77	38.15	41,55	35.85	43.06	43.95	44.0
Total		49.95	55.96	50.59	60.38	61.48	62.24

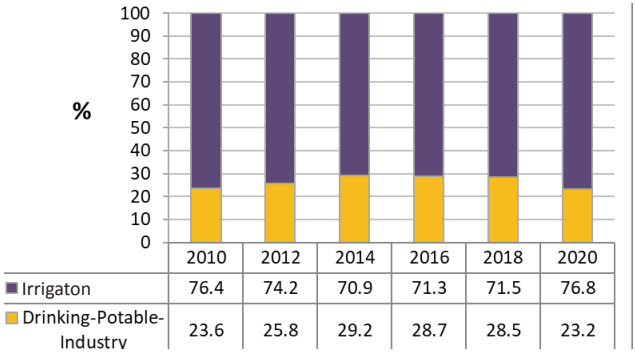
(*) No available information.

Note: TURKSTAT data includes seawater consumption.

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

For other data; TURKSTAT "Sectoral Water and Wastewater Statistics, 2020" Newsletter

GRAPH 29- WATER CONSUMPTION BY SECTORS, (2010-2020)



	2010	2012	2014	2016	2018	2020
Irrigaton	76.4	74.2	70.9	71.3	71.5	76.8
Drinking-Potable-Industry	23.6	25.8	29.2	28.7	28.5	23.2

The water exploitation index (WEI) is determined by dividing the average annual total amount of water abstracted from freshwater by the average annual renewable freshwater resources of a country. It is expressed as a percentage.

The average annual precipitation in Turkey is 574 mm, which corresponds to an annual water volume of 450 billion m^3 in the country. Under today's technical and economic conditions, the surface water potential that can be consumed for various purposes averages 94 billion m^3 per year. Together with the groundwater potential, which was determined to be 18 billion m^3, the consumable surface and underground water potential of our country is 112 billion m^3 per year, of which 57 billion m^3 is used. The annual amount of usable water per capita in our country was 1652 m^3 in 2000, 1544 m^3 in 2009 and 1346 m^3 in 2020[42].

6.2- Oxygen Consuming Substances in Rivers

D P **S** I R

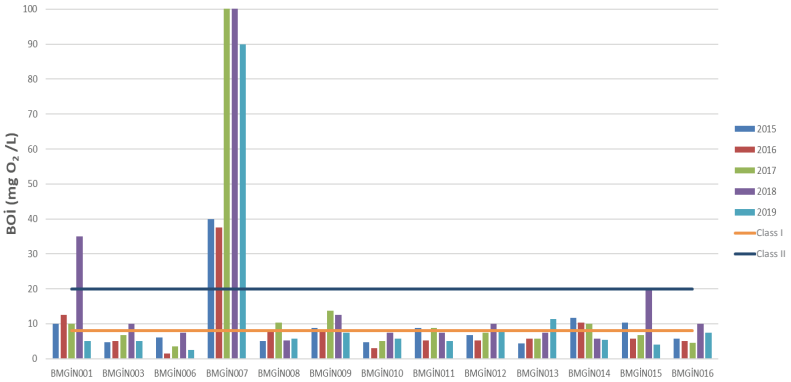
The most important indicator of the oxygenation state in water bodies is biochemical oxygen demand (BOD), parameter which indicates the demand of aquatic organisms for oxidizable organic matter in a water body. In addition, ammonium is also a parameter that causes oxygen consumption in water bodies. The indicator "Oxygen Consuming Substances in Rivers" is a state indicator that shows the current status and trends of ammonium (NH_4) and BOD in rivers.

The results of the monitoring programs carried out by the Ministry of Agriculture and Forestry in different basins are evaluated according to the criteria specified in the "By-

Law on Surface Water Quality Management" (Annex-5, Table 2), and the current status is determined with respect to the parameters BOD and NH_4.

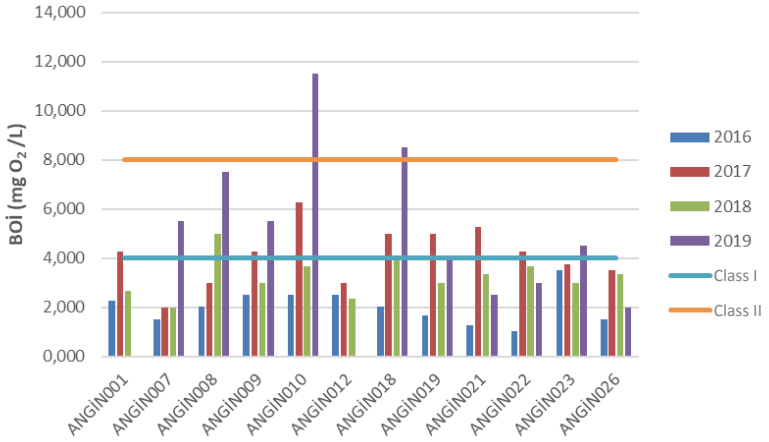
The water quality, in general, in the basins where the measurements were carried out, is classified as Class I - II - quality as far as the parameter BOD is concerned. On the other hand, it is observed that the water quality is worse in the Büyük Menderes Basin, which is under strong urban, agricultural and industrial pressure[43].

GRAPH 30- BÜYÜK MENDERES BASIN BIOCHEMICAL OXYGEN DEMAND (mg/L O_2)



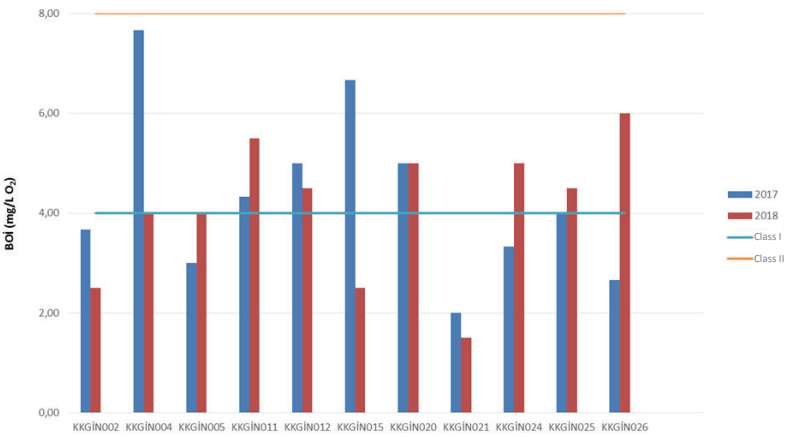
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management;2021

GRAPH 31- ANTALYA BASIN BIOCHEMICAL OXYGEN DEMAND (mg/L O_2)



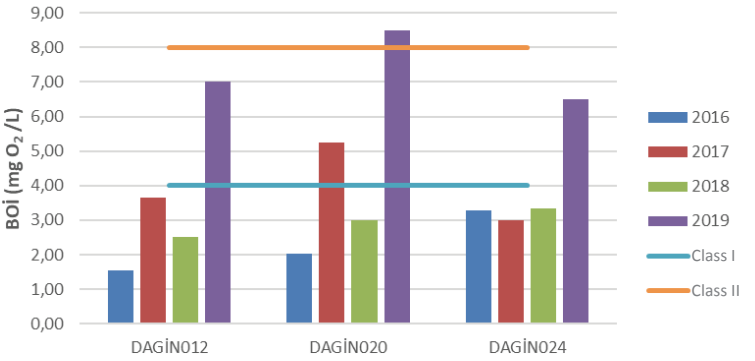
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 32- KONYA CLOSED BASIN BIOCHEMICAL OXYGEN DEMAND (mg/L O_2)



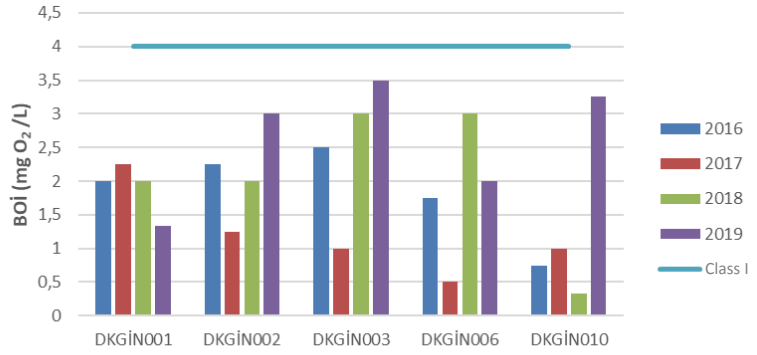
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 33- EAST MEDITERRANEAN BASIN BIOCHEMICAL OXYGEN DEMAND (mg/L O_2)



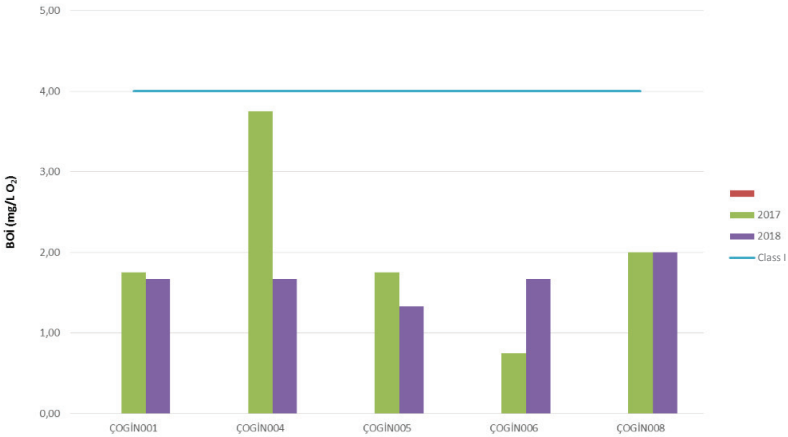
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 34- EAST BLACK SEA BASIN BIOCHEMICAL OXYGEN DEMAND (mg/L O_2)



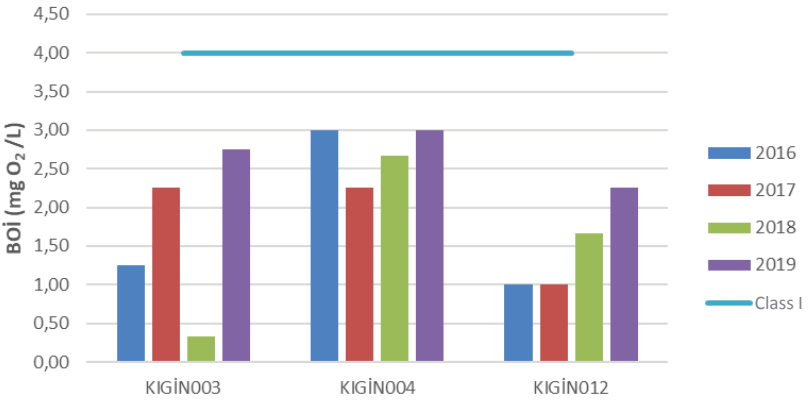
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 35 - ÇORUH BASIN BIOCHEMICAL OXYGEN DEMAND (mg/L O_2)



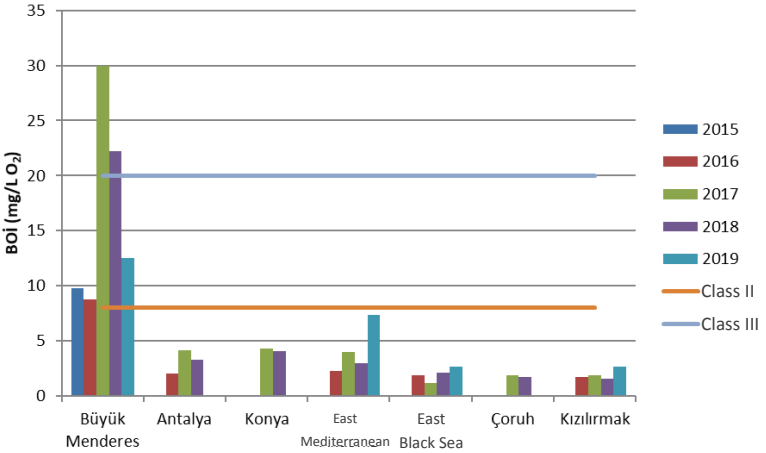
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 36- KIZILIRMAK BASIN BIOCHEMICAL OXYGEN DEMAND (mg/L)



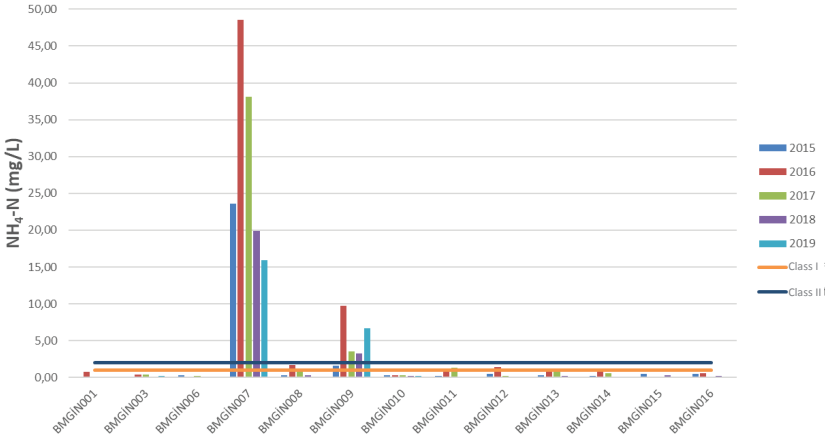
Regarding the parameter BOD, it can be said that an improvement in water quality can be observed, especially in 2019, when the change in the basins is considered by year. It can be seen that the water quality in the basins located in the Eastern Black Sea region is at a better level away from the industrial pressure. However, in the Büyük Menderes Basin, where intensive urban, industrial and agricultural activities take place, the water quality is III.-IV. at grade levels.

GRAPH 37– BOD CONCENTRATION CHANGE OVER THE YEARS



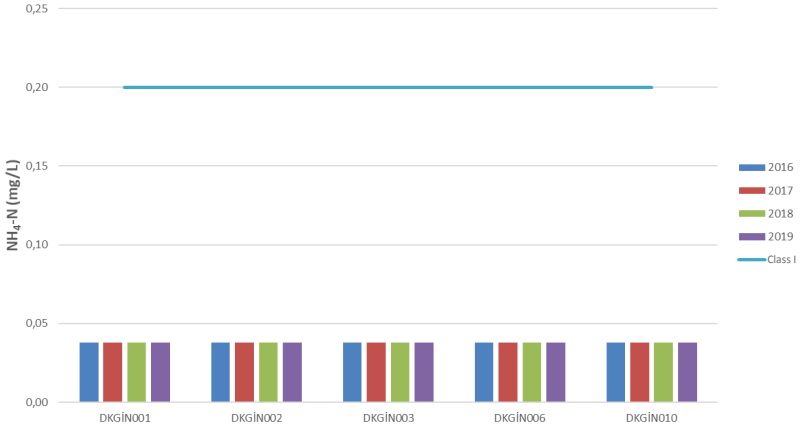
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 38-BÜYÜK MENDERES BASIN NO_4-N (mg/L)



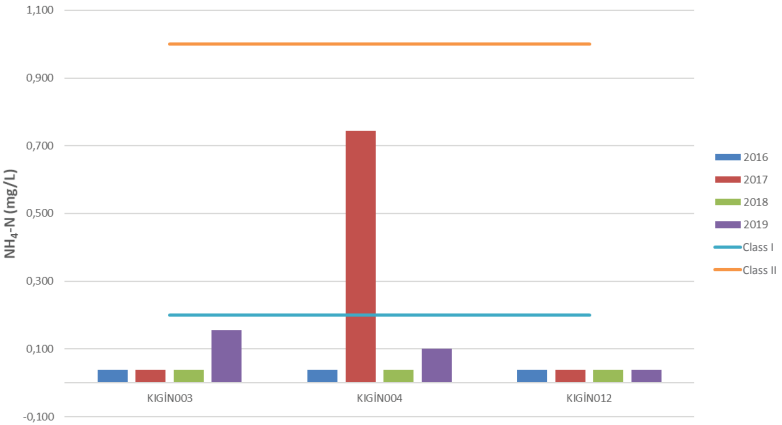
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 39–EASTERN BLACK SEA BASIN NO_4-N (mg/L)



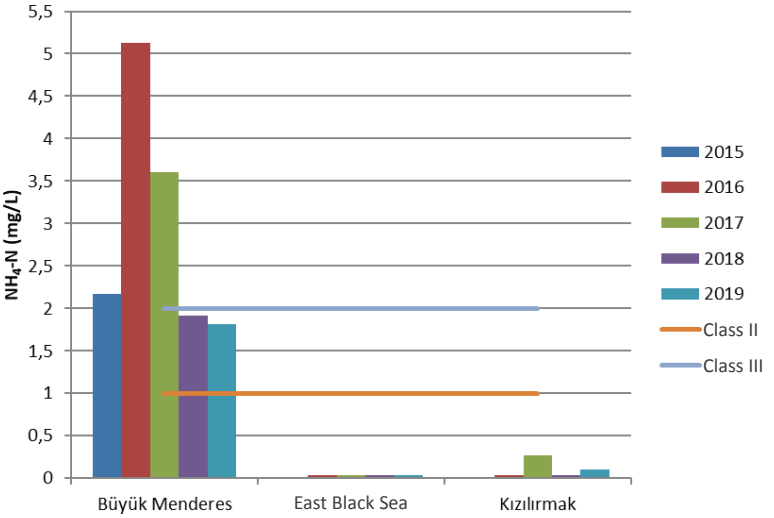
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH-40 KIZILIRMAK BASIN NH_4-N (mg/L)



Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH-41 CHANGE OF NH_4-N CONCENTRATION IN BASINS BY YEARS (mg/L)



Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

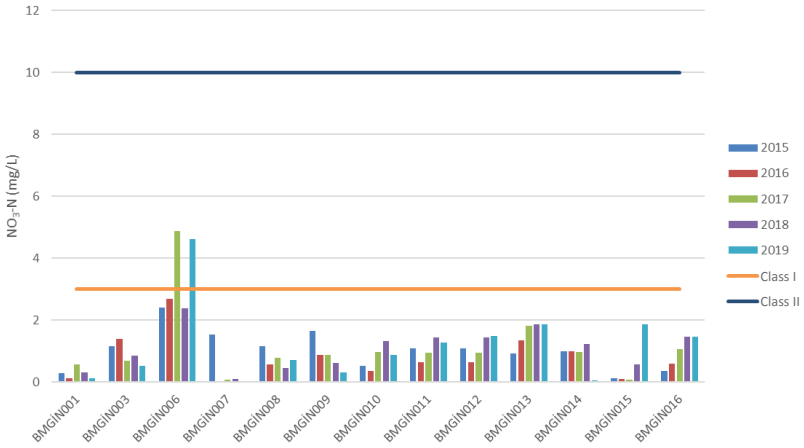
6.3- Nutrients in Freshwater Resources

D P **S** I R

High levels of nitrogen and phosphorus entering water bodies from urban, industrial, and agricultural areas can cause eutrophication. The indicator is a state indicator and is used to show current nutrient levels and their temporal and spatial variations. The changes in the parameters total nitrogen (TN), nitrate-nitrogen (NO_3-N), and orthophosphate-phosphorus (o-PO_4-P) in water bodies over time were examined as part of this indicator.

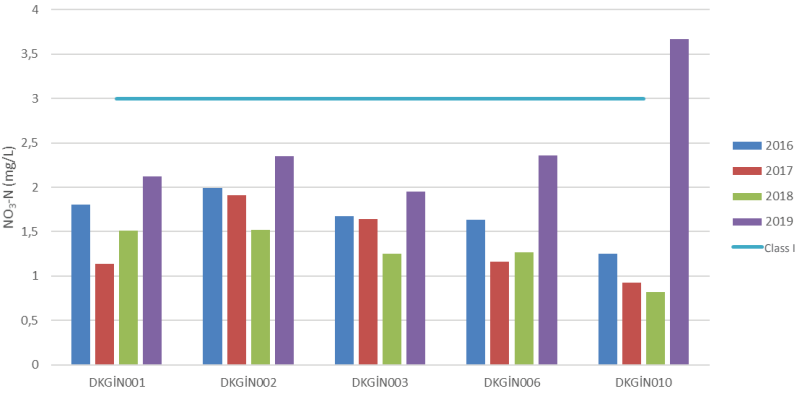
The results of the monitoring programs carried out by the Ministry of Agriculture and Forestry in different basins are evaluated according to the criteria specified in the "By-Law on Surface Water Quality Management", Annex-5, Table 2, and the current status is determined with respect to the parameters TN, NO_3-N and orthophosphate-phosphorus o-PO_4-P. For the NO_3-N parameter, the water quality in the basins where the measurements were carried out is generally assigned to quality Class I. In contrast, the water quality in Büyük Menderes and the Eastern Black Sea Basins corresponds on average to quality Class II with respect to the parameter TN. For the parameter O-PO_4, the water quality can generally be described as Class II[44].

GRAPH 42– BÜYÜK MENDERES BASIN NO_3-N (mg/L)



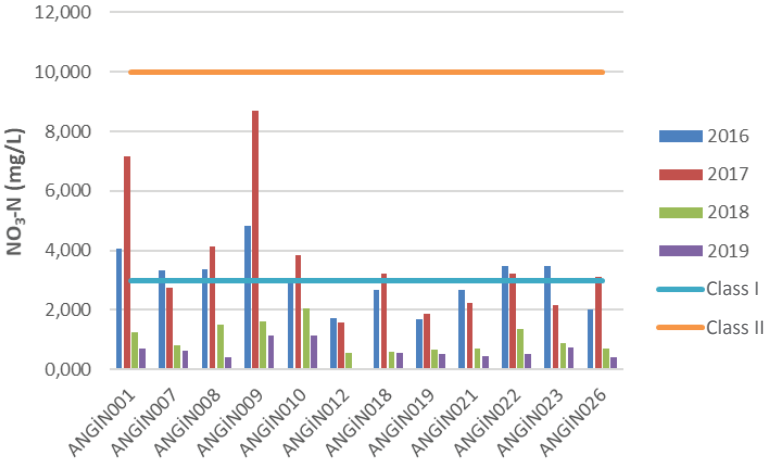
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 43– EAST BLACK SEA BASIN NO_3-N (mg/L)



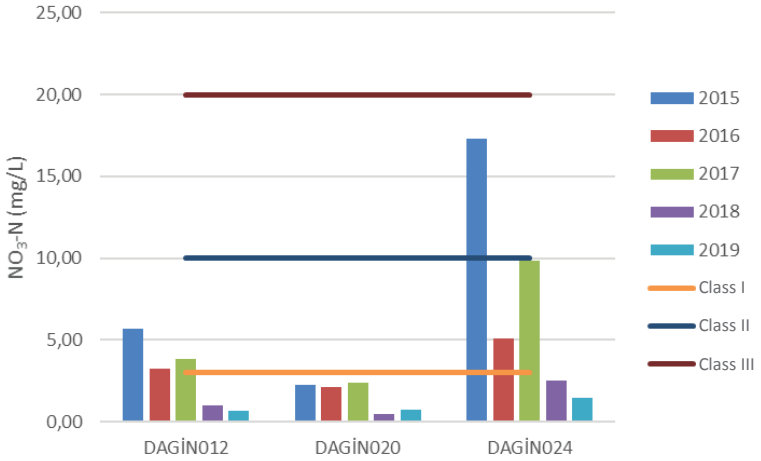
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 44 – ANTALYA BASIN NO_3-N (mg/L)



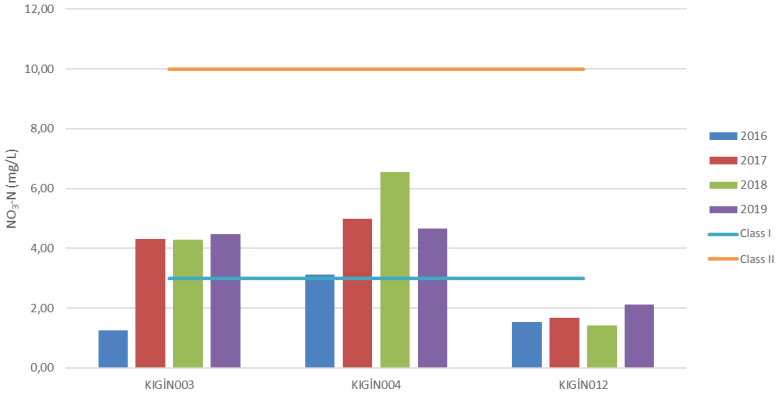
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 45- EASTERN MEDITERRANEAN BASIN NO_3-N (mg/L)



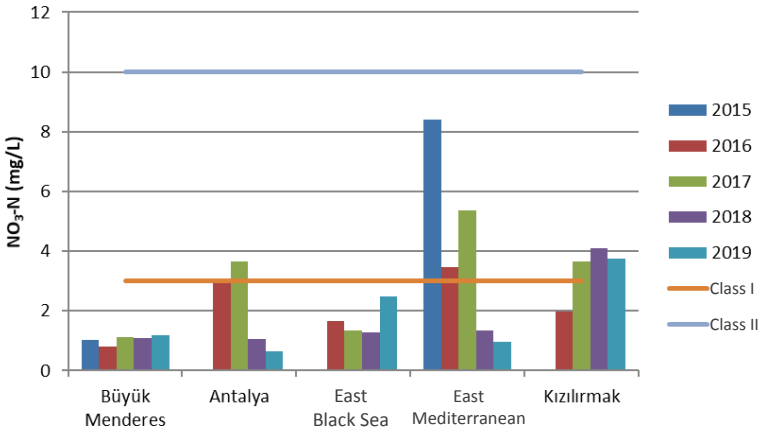
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 46- KIZILIRMAK BASIN NO_3-N (mg/L)



Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

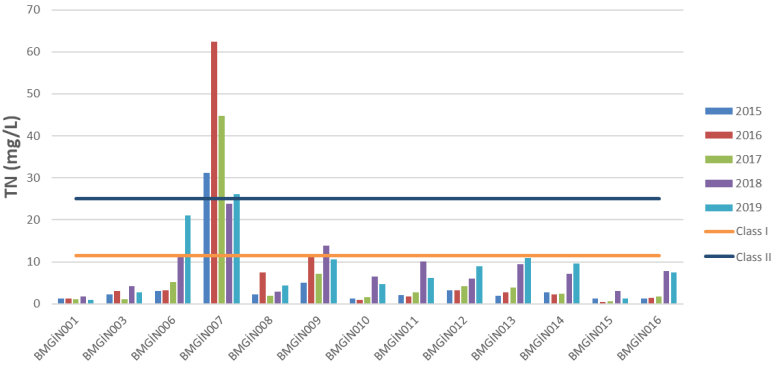
GRAPH 47 – CHANGE OF NO_3-N CONCENTRATION IN BASINS BY YEARS



Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

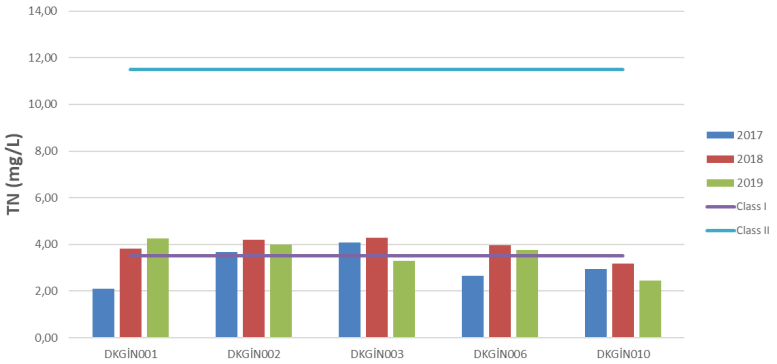
In general, for the parameter NO3-N, it can be said that the water quality improved in 2019 compared to 2018. However, there is no regular and significant improvement trend. However, the water quality with respect to this parameter is good across the basins.

GRAPH 48 – BÜYÜK MENDERES BASIN TN (mg/L)



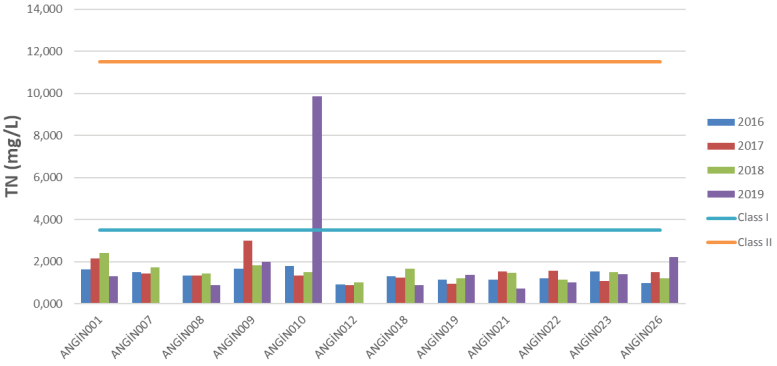
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 49 – EAST BLACK SEA BASIN TN (mg/L)



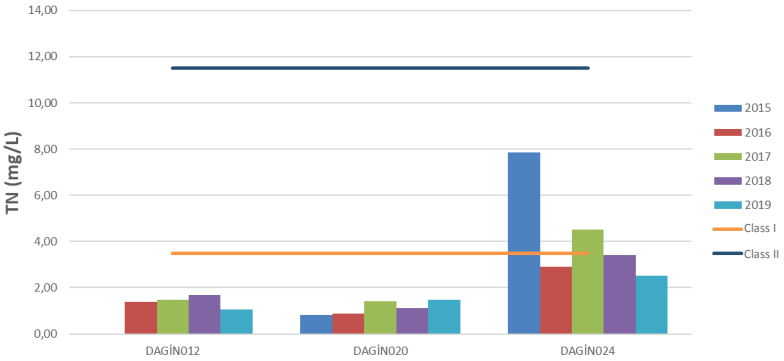
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 50 – ANTALYA BASIN TN (mg/L)



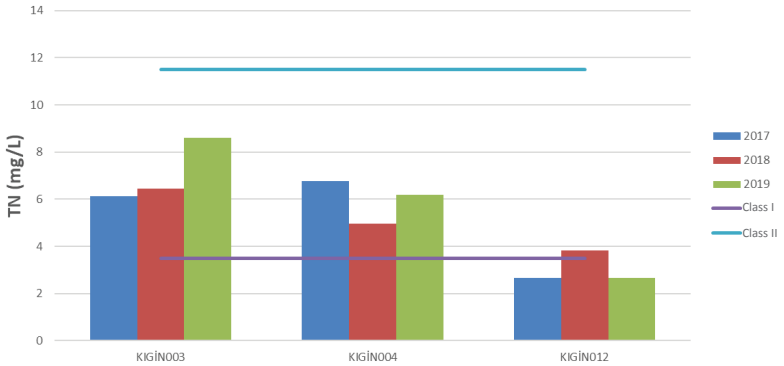
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 51 – EASTERN MEDITERRANEAN BASIN TN (mg/L)



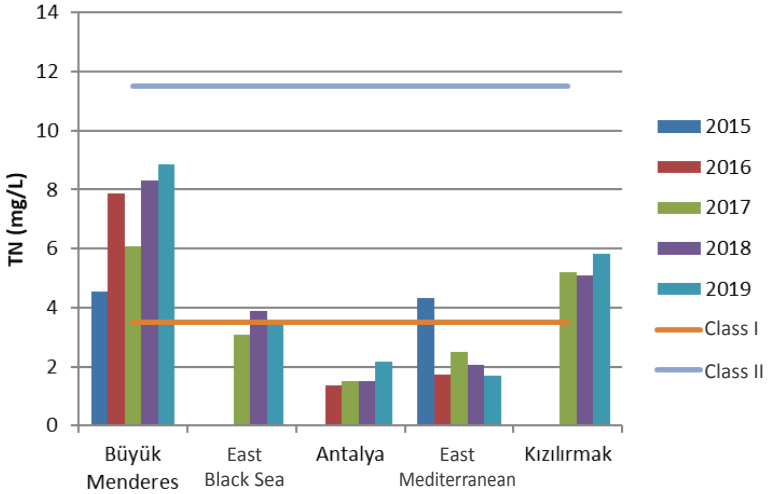
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 52 – KIZILIRMAK BASIN TN (mg/L)



Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

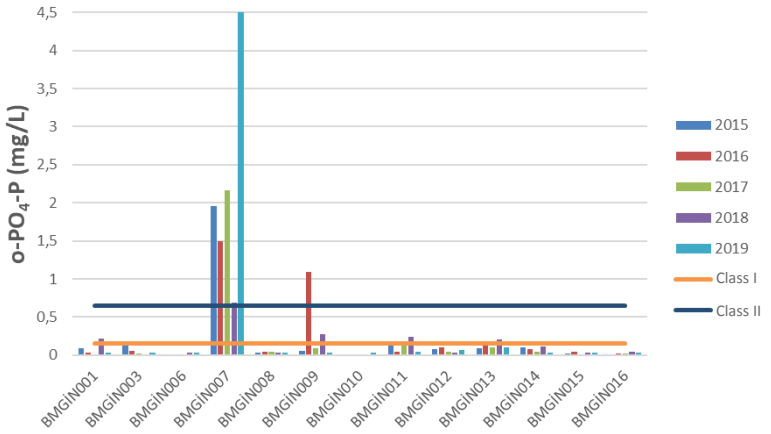
GRAPH 53 – CHANGE OF TN CONCENTRATION IN BASINS BY YEARS



Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

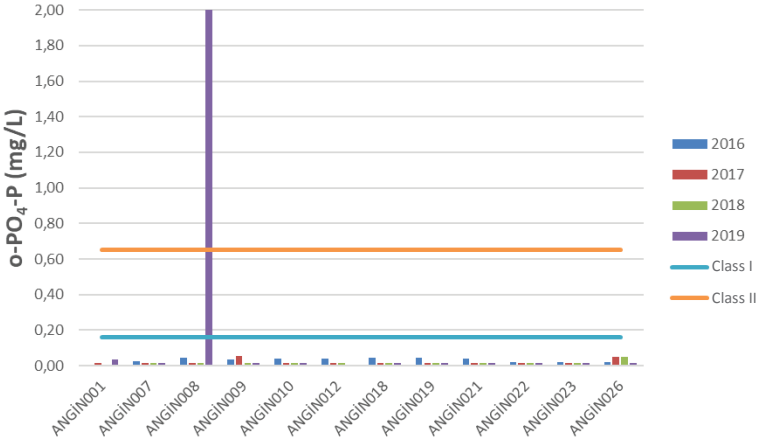
As for the TN parameters in the basins, the water quality varies between classes I and II. In this context, the water quality in relation to the parameter TN is good in the basins where the measurement is carried out.

GRAPH 54 – BÜYÜK MENDERES BASIN o-PO_4-P (mg/L)



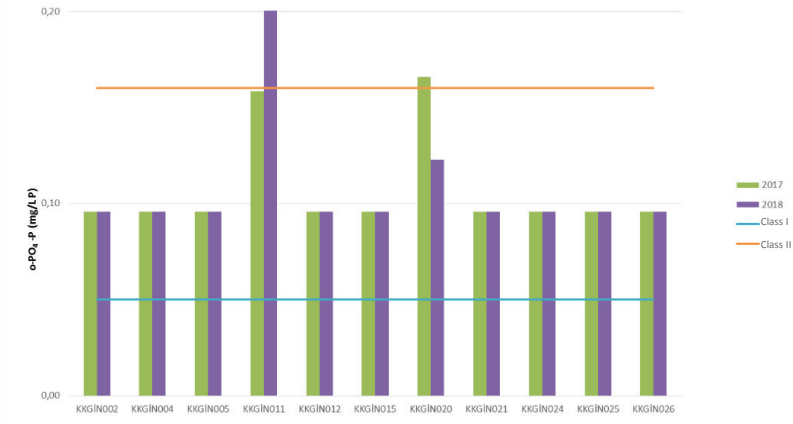
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 55 – ANTALYA BASIN o-PO_4-P (mg/L)



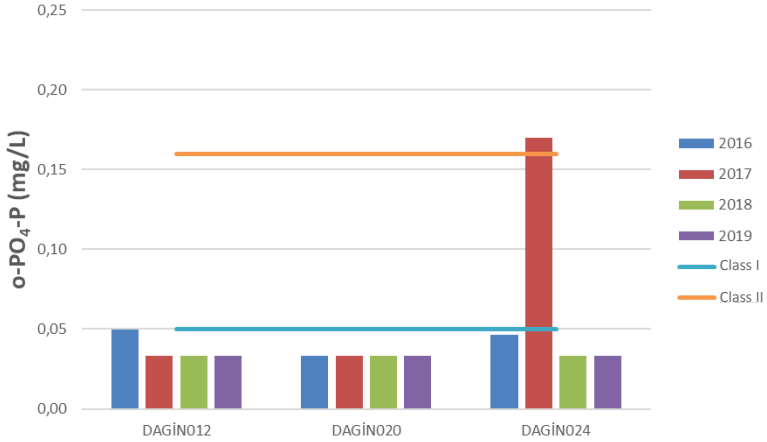
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 56 – KONYA CLOSED BASIN o-PO_4-P (mg/L)



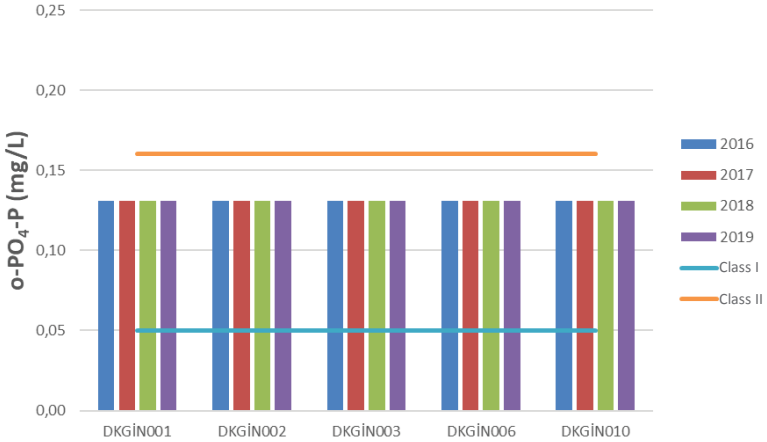
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 57 – EASTERN MEDITERRANEAN BASIN o-PO_4-P (mg/L)



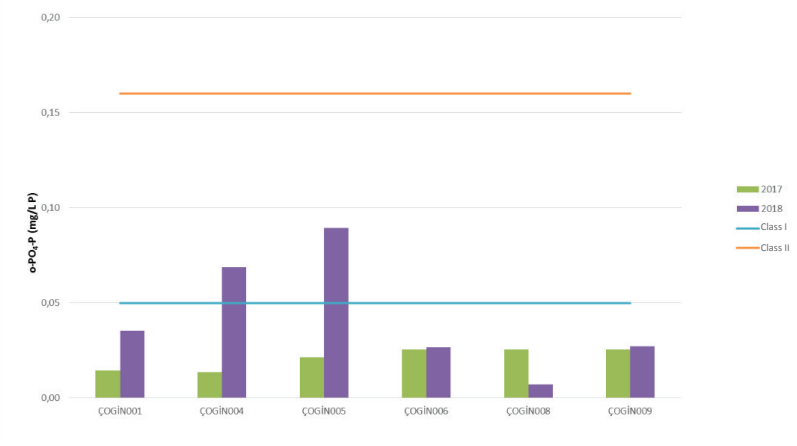
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 58 – EASTERN BLACK SEA BASIN o-PO_4-P (mg/L)



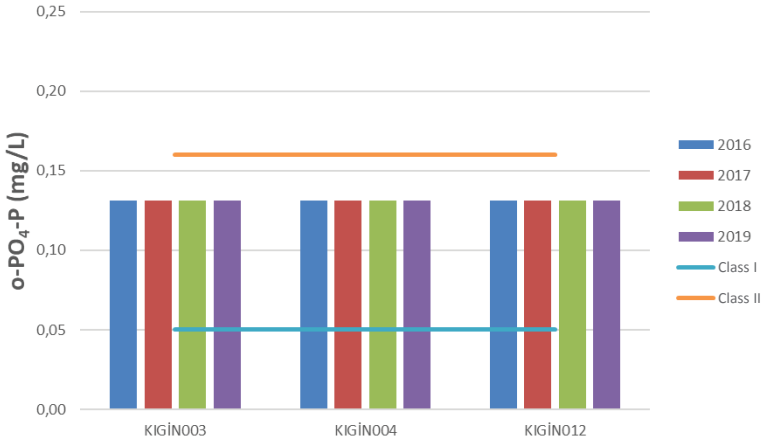
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 59 – ÇORUH BASIN o-PO_4-P (mg/L)



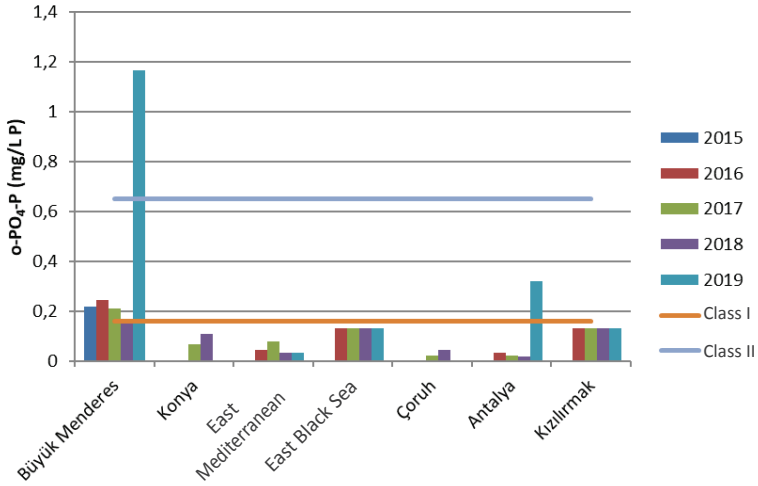
Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 60 – KIZILIRMAK BASIN o-PO_4-P (mg/L)



Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

GRAPH 61 – CHANGE OF O-PO_4-P CONCENTRATION IN BASINS BY YEARS



Source: Ministry of Agriculture and Forestry, General Directorate of Water Management,2021

Looking at the variation of o-PO_4-P parameter by years on the basis of the basin areas, we cannot speak of a general trend, but we notice that the water is at the quality level of Class II with respect to this parameter. However, in Büyük Menderes Basin, which was under the influence of intensive urban, agricultural and industrial pressures, this parameter was observed at the quality level of Class IV before 2018 and 2019. On the other hand, an improvement in water quality was observed in 2018 and the Class III quality was achieved with respect to the parameter o-PO_4-P. However, in some water bodies in the Büyük Menderes and Antalya basins, a significant deterioration of water quality is observed in 2019 with respect to the parameter o-PO_4-P and other parameters[45].

6.4- Chlorophyll-a Concentration in Coastal and Marine Waters

D P **S** I R

Chlorophyll-a is an indicator of phytoplankton biomass and performs photosynthesis. This mechanism provides for the production of primary organic matter in the nutrient cycle. The organic load and organic wastes generated in the euphotic zone and produced in the connected productions settle deeper in the water column. In the meantime, they consume the oxygen dissolved in the water and, through bacterial degradation, reduce the oxygen required for life.

The Laboratory, Measurement and Monitoring Department of the Ministry of Environment and Urbanization implemented the "Integrated Marine Pollution Monitoring Program" under the coordination of the TUBITAK-Marmara Research Center

Under this program, the quality and pollution status of our seas are determined based on various indicators through monitoring studies in the Mediterranean Sea, the Aegean Sea, the Sea of Marmara and the Black Sea.

Marine pollution and quality are assessed on the basis of water management units (WMUs). Water Management Units, or Coastal Water Bodies, define a section of surface water delineated by important surface water characteristics such as physical, hydromorphological, ecological, and loading analyses. They are the smallest management units covered by the Water Framework Directive.

The highest chlorophyll-a levels were observed in shallow and less saline coastal areas fed by rivers and other terrestrial inputs such as domestic/urban wastewater (AKD-1 (Asi River), AKD-4 (Ceyhan River), AKD-5 (Seyhan River)) in the Mediterranean Sea. Chlorophyll-a levels were low and at their natural levels in the surface waters of the open sea, where the effects of terrestrial inputs were attenuated, and in the clean coastal zone (region between Anamur and Marmaris). The effects of terrestrial inputs in the water column extended to 5-10 m depth. The variation of the 2019 summer period values with depth was investigated. Accordingly, high values of the biomass indicator Chl-a were measured in the coastal areas of the gulfs of Mersin and İskenderun, which are fed by rivers and where low salinity and Secchi Disc Depth values were observed. On the other hand, Chl-a values were in the lower range in the surface waters of the coastal area and the reference zone, where terrestrial inputs were lower (Graph 62).

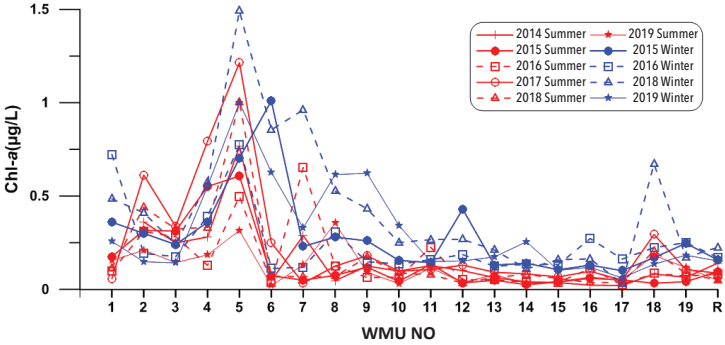
In the assessment of surface layer chlorophyll-a concentrations in the Aegean Sea 2014-2019 WMUs, although no significant differences were observed between summer and winter sampling, relatively high values were observed in the Inner and Central Gulf of İzmir and the Gulf of Güllük. Relatively high values in the northern Aegean during the winter months probably originate from the Sea of Marmara (Graph 63).

Analysis of the surface distribution of chlorophyll-a in winter and summer 2019 shows that concentrations in the entire Black Sea are 0.4-3.6 µg / L in summer and 0.1-8.9 µg/L in winter. Relatively higher values (˜ 3.0 µg / L) were generally measured between Rize and Samsun in winter and only in Samsun in summer (TRKSK1: 8.9 µg / L). Most of the open stations remained under < 1 µg / L. When the 2014-2019 surface layer chlorophyll-a concentrations are compared, it can be seen that winter values are generally higher

than summer values. The 2019 winter and summer concentrations are consistent with those of previous periods (Graph 64).

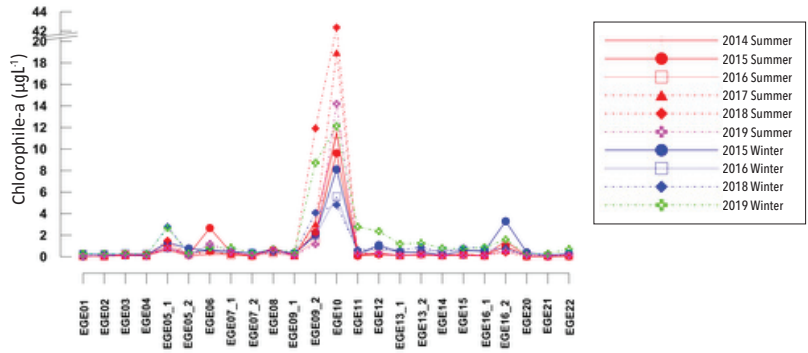
These two periods (especially the spring period) had high values in almost all WMUs in the Marmara Sea during winter and spring 2019. Concentrations in summer 2019 are consistent with previous summer concentrations (Graph 65).

GRAPH 62- 2014-2019 COMPARISON OF THE MEDITERRANEAN SURFACE WATER CHLOROPHILE-A CONCENTRATIONS



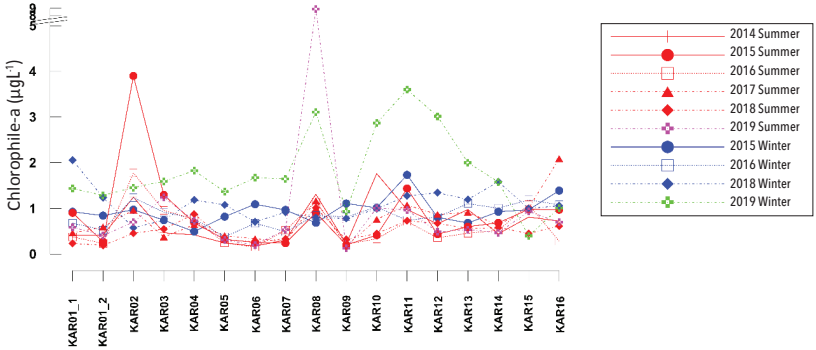
Source: MOEUCC-DG for EIA, Permitting and Inspection and TÜBİTAK-MAM (2019). Integrated Pollution Monitoring Project (2017-2019). ÇTÜE 5178702, Report No. ÇTÜE.17.2111 (The Mediterranean Final Report, 2019), February 2019, Gebze-Kocaeli.

GRAPH 63- 2014-2019 COMPARISON OF THE EAGEAN SURFACE WATER CHLOROPHILE-A CONCENTRATIONS



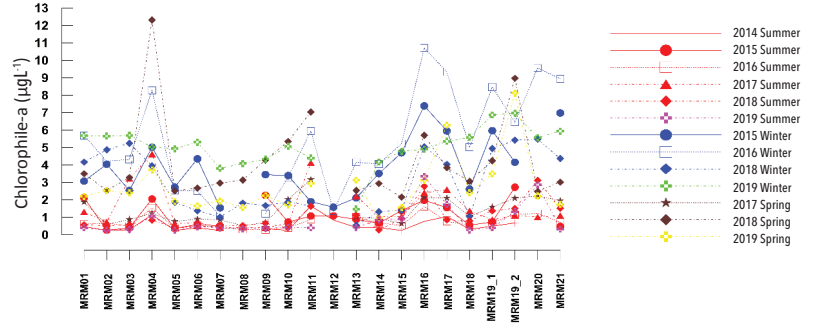
Source: MOEUCC-DG for EIA, Permitting and Inspection and TÜBİTAK-MAM (2019). Integrated Pollution Monitoring Project (2017-2019). ÇTÜE 5178702, Report No. ÇTÜE.17.2113 (The Aegean Sea Final Report, 2019), February 2019, Gebze-Kocaeli

GRAPH 64- 2014-2019 COMPARISON OF THE BLACK SEA SURFACE WATER CHLOROPHILE-A CONCENTRATIONS



Source: MOEUCC-DG for EIA, Permitting and Inspection and TÜBİTAK-MAM (2019). Integrated Pollution Monitoring Project (2017-2019). ÇTÜE 5178702, Report No. ÇTÜE.17.2115 (The Black Sea Final Report, 2019), February 2019, Gebze-Kocaeli.

GRAPH 65- 2014-2019 COMPARISON OF THE MARMARA SEA SURFACE WATER CHLOROPHILE-A CONCENTRATIONS



Source: MOEUCC-DG for EIA, Permitting and Inspection and TÜBİTAK-MAM (2019). Integrated Pollution Monitoring Project (2017-2019). ÇTÜE 5178702, Report No. ÇTÜE.17.2116 (The Marmara Sea Final Report, 2019), February 2019, Gebze-Kocaeli

6.5- Nutrients in Coastal and Marine Waters

D P **S** I R

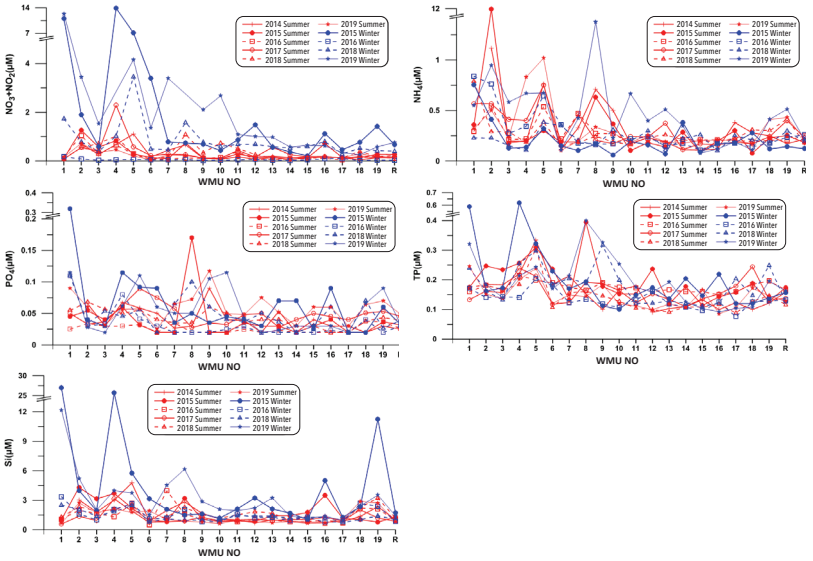
The nutrient indicator is a state indicator and is used to show geographic changes in current nutrient concentrations and trends over time. Widespread inputs of nitrogen and phosphorus from urban, industrial, and agricultural areas carried/discharged to the sea can cause eutrophication.

The Laboratory, Measurement and Monitoring Department of the Ministry of Environment and Urbanization, under the coordination of the TUBITAK-Marmara Research Center, has implemented the "Integrated Marine Pollution Monitoring Program." Under this program, the quality and pollution status of our seas are determined based on various indicators through monitoring studies in the Mediterranean Sea, Aegean Sea, Sea of Marmara, and Black Sea.

The assessment of marine pollution and quality is based on water management units (WMUs). Water management units or coastal water bodies define a surface water section delineated by key surface water characteristics such as physical, hydromorphological, ecological, and pollution analyzes. They are the smallest management units covered by the Water Framework Directive. Concentrations of dissolved inorganic nitrogen (CHIN), silicate (Si), nitrite-nitrate-nitrogen (Nox), and total phosphorus (TP) were assessed in the surface nutrient distribution46.

PO_4 and TP levels in Mediterranean coastal waters were relatively high in İskenderun and Mersin Bays, where terrestrial pressures were evident. The highest values were measured in the surface waters of WMU fed by the river discharges (Asi, Ceyhan, Seyhan, Göksu river waters) in winter. The average values of phosphate and TP in the surface waters of the WMU decreased with the seasonal decrease in stream flows in late summer (August), and similar average values were measured in marine areas where terrestrial pressure was weak. The areal distribution of total dissolved inorganic nitrogen (DIN) and the average values of WMUs showed a decreasing trend from İskenderun Bay Region to Marmaris Bay (east-west direction) in the Mediterranean Region, depending on the streamflow. The DIN concentration values in the coastal and open seawaters of Antalya Bay and the Finike region were in accordance with the general characteristics of the eastern Mediterranean in summer and winter. Nox concentrations increased significantly in winter in coastal marine areas affected by the discharges due to the seasonal increase in river discharge and precipitation in winter. This seasonal change is consistent with the high PO4, TP, and low SDD levels measured during the same periods in the WMUs of the eastern region where terrestrial pressures are evident (Graph 66).

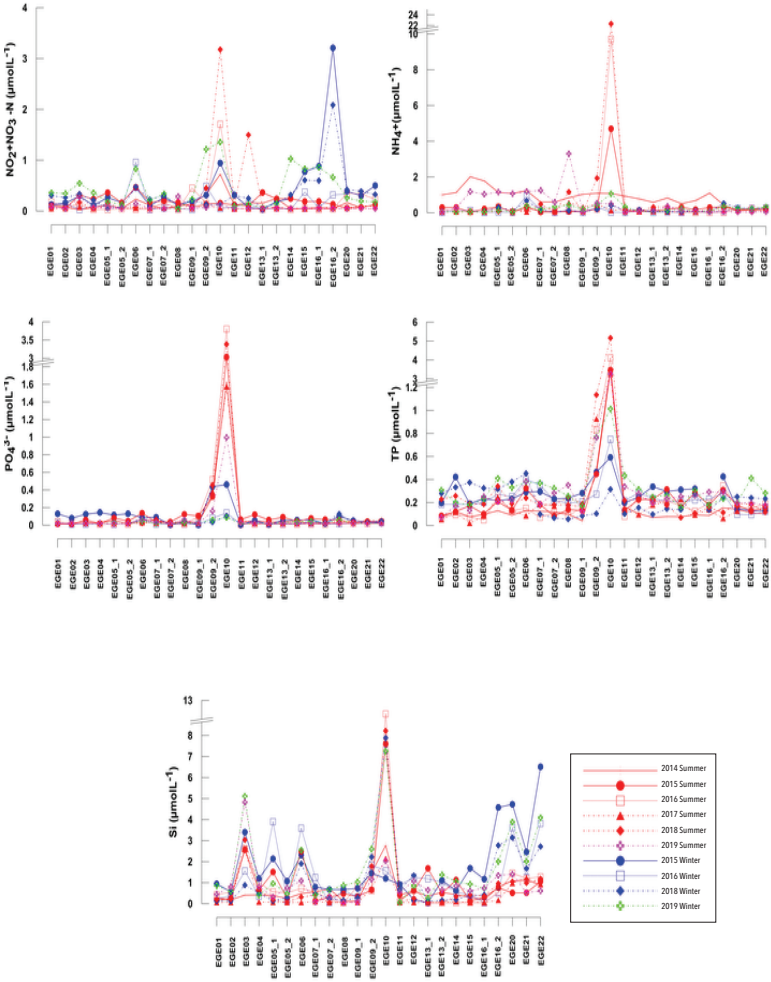
GRAPH 66- 2014-2019 COMPARISON OF MEDITERRANEAN SURFACE WATER NUTRIENT PARAMETERS



Source: MOEUCC-DG for EIA, Permitting and Inspection and TÜBİTAK-MAM (2019). Integrated Pollution Monitoring Project (2017-2019). ÇTÜE 5178702, Report No. ÇTÜE.17.2111 (Mediterranean Final Report, 2019), February 2019, Gebze-Kocaeli.

When the nutrient salt concentrations in the Aegean Sea were assessed seasonally, no significant difference between summer and winter values was observed. However, 2019 values were found to be low in all WMUs. Nox values were observed to be generally below 0.5 µM in both seasons, but concentrations were found to be 2-4 times higher (0.5-2 M), especially in EGE06 (Büyük Menderes River Estuary) and EGE10 (Inner Gulf of İzmir). This situation can be explained by the fact that both WMUs are under the influence of river inflow. In addition, it is assumed that the Inner Gulf of İzmir is under the influence of urban discharges. At the mouth of the Meriç River (EGE16), a strong river influence was observed during the sampling period. At the same time, the surface waters rich in nutrients from the Sea of Marmara were assumed to influence the Dardanelles Strait. All sampling events, including those of 2019, showed that nutrient concentrations in EGE10 were significantly higher than in the other WMUs (Graph 67).

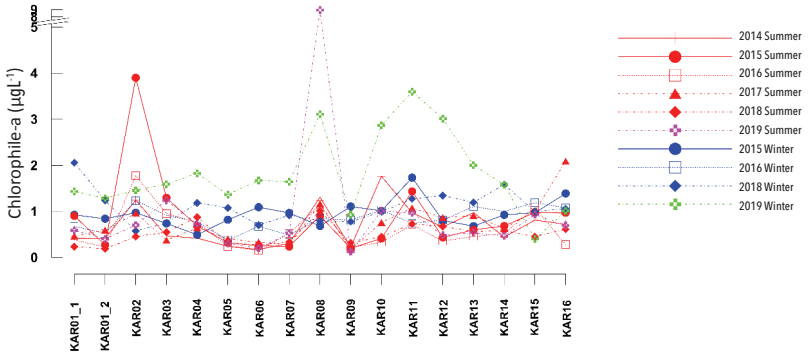
GRAPH 67- 2014-2019 COMPARISON OF AEGEAN SURFACE WATER NUTRIENT PARAMETERS



Source: MOEUCC-DG for EIA, Permitting and Inspection and TÜBİTAK-MAM (2019). Integrated Pollution Monitoring Project (2017-2019). ÇTÜE 5178702, Report No. ÇTÜE.17.2113 (Aegean Sea Final Report, 2019), February 2019, Gebze-Kocaeli

Although higher values are generally observed in the Black Sea during the winter months, the most striking feature is the high nitrogen and silicate values in the WMU (2,7,10) under the influence of the Sakarya, Kızılırmak, and Yeşilırmak rivers (Graph 68). In addition, high phosphorus values are recorded in KAR08, which is under the influence of Samsun city.

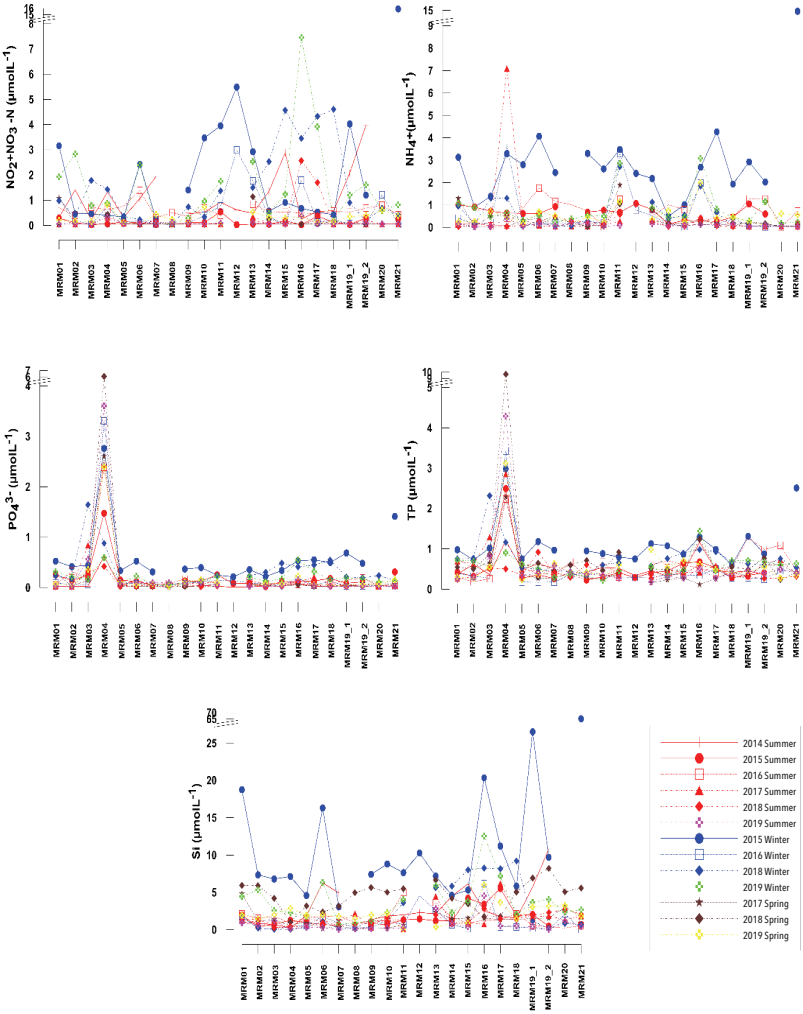
GRAPH 68- 2014-2019 COMPARISON OF BLACK SEA SURFACE WATER NUTRIENT PARAMETERS



Source: MOEUCC-DG for EIA, Permitting and Inspection and TÜBİTAK-MAM (2018). Integrated Pollution Monitor¬ing Project (2017-2019). ÇTÜE 5178702, Report No. ÇTÜE.17.2115 (Black Sea Final Report, 2019), February 2019, Gebze-Kocaeli.

It can be observed that nutrient levels in the Sea of Marmara are measured higher in winter than in spring and summer, but there are also differences between years (Graph 69). All nutrients are at their lowest in spring, indicating that primary producers are consuming them. Phosphorus compounds were measured at the highest level in MAR04 (Gulf of Bandırma) at all seasons, indicating the permanent existence of industrial and domestic pressures. Apart from this, relatively high nitrogen compounds and silicates were detected in the WMUs (1-2-20-21) under the influence of Susurluk and in the Gulf of Izmit (16-17).

GRAPH 69- 2014-2019 COMPARISON OF MARMARA SEA SURFACE WATER NUTRIENT PARAMETERS



Source: MOEUCC-DG for EIA, Permitting and Inspection and TÜBİTAK-MAM (2019). Integrated Pollution Monitoring Project (2017-2019). ÇTÜE 5178702, Report No. ÇTÜE.17.2116 (Marmara Sea Final Report, 2019), February 2019, Gebze-Kocaeli.

6.6- Oxygen Status in the Marines

D P **S** I R

One of the most important indicators of environmental status is the amount of dissolved oxygen. In terms of ecosystem health, it is known that the dissolved oxygen levels in the intermediate and bottom layers is about 4-5 mg/L. The gradual decrease of oxygen in the bottom waters (in deep bottom waters and in the bottom/soil waters of the gulfs) increases the risk of the extinction of life and the formation of hydrogen sulfide.

The Ministry of Environment, Urbanization and Climate Change, Department of Laboratory Measurement and Monitoring, carries out the "Integrated Marine Pollution Monitoring

Program" in cooperation with TUBITAK Marmara Research Center. Under the program, studies are conducted to monitor pollution and marine quality using various indicators in all Turkish seas—the Black Sea, the Sea of Marmara and the straits, the Mediterranean Sea, and the Aegean Sea.

In the Mediterranean Sea, the oxygen saturation of the surface water in summer is 97–112%, and the concentration values ranged between 4.20 and 8.33 mg/L (Graph 70).

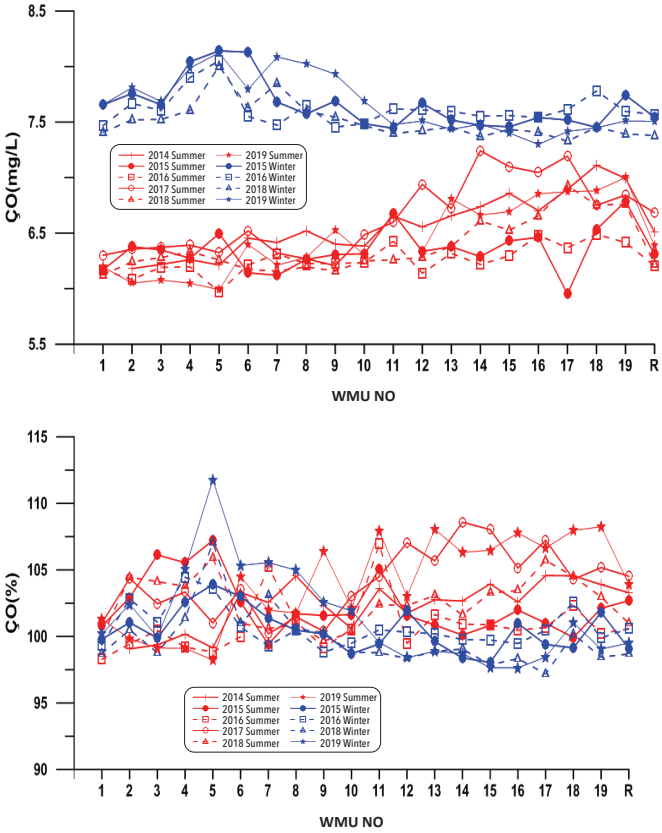
The dissolved oxygen values measured in coastal and open surface waters of the Aegean Sea were generally in the range of 95-115% in both sampling periods. DO values changed in the range of 5.5-9.88 mg/L in the winter period and between 4.1-8.0 mg/L in the summer period, with an average value of 6.9 mg/L. Values at depths >200 m varied between 4.6 and 8.3 mg/L (Graph 71).

Saturated dissolved oxygen (DO) values in the Black Sea were generally measured in the range of 95%-115% between 2014 and 2019 (Graph 72).

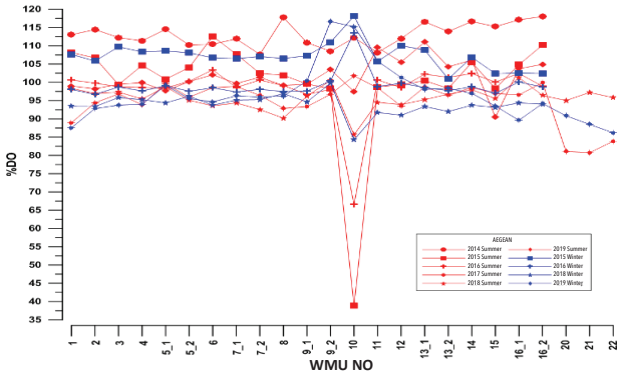
Due to the bi-layered structure constantly present in the Sea of Marmara, the oxygen-saturated upper layer waters cannot reach the lower layer due to the interlayer barrier so that a low oxygen content is observed in the lower water. However, the living and non-living organic matter that increases in surface waters with the increase of terrestrial input collapses over time and becomes trapped in the intermediate layer, and when it is degraded by heterotrophs, the oxygen in the environment is consumed and hypoxic conditions are formed. In all time periods, the dissolved oxygen saturation levels in

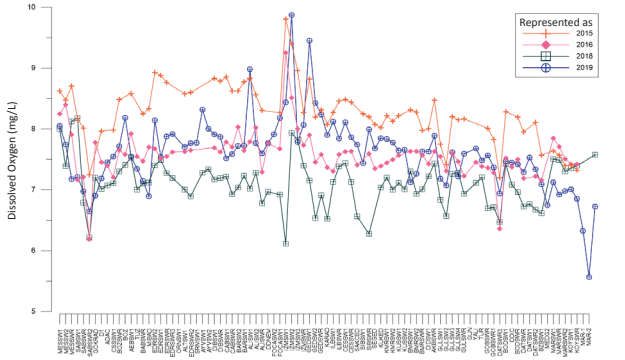
surface waters of the WMUs in the Sea of Marmara (0-10 m average) were generally varied between 90% and 110% (Graph 73).

GRAPH 70- DISSOLVED OXYGEN VALUES AND PERCENTAGE VALUES IN THE MEDITERRANEAN SEA BETWEEN 2014-2019

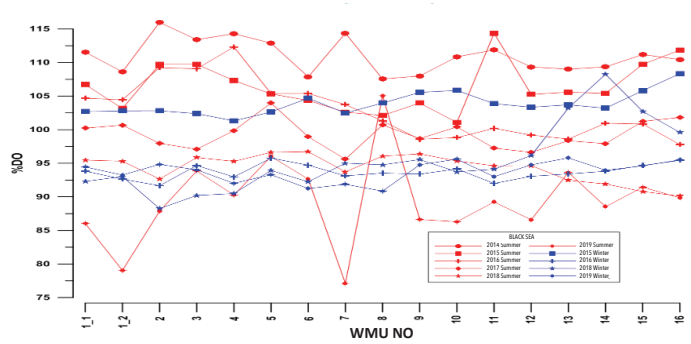


GRAPH 71- DISSOLVED OXGYEN VALUES AND PERCENTAGES IN THE EAGEAN SEA BETWEEN 2014-2019

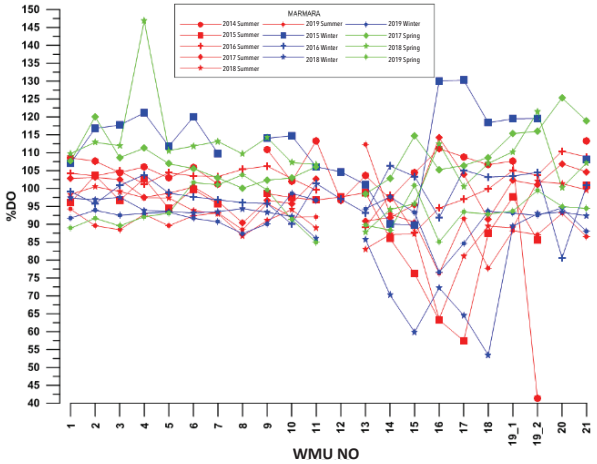




GRAPH 72- PERCENTAGE OF DISSOLVED OXYGEN IN THE BLACK SEA BETWEEN 2014-2019



GRAPH 73- PERCENTAGE OF DISSOLVED OXYGEN IN THE SEA OF MARMARA BETWEEN 2014-2019



Source: MOEUCC-DG for EIA, Permitting and Inspection and TÜBİTAK-MAM (2019). Integrated Pollution Monitoring Project (2017-2019). ÇTÜE 5178702, Report No. ÇTÜE.17.2116 (Marmara Sea Final Report, 2019), February 2019, Gebze-Kocaeli.

6.7- Bathing Water Quality

D P S I R

The indicator is a state indicator and refers to the impact of municipal wastewater on the quality of marine and coastal waters.

The General Directorate of Public Health of the Ministry of Health conducts bacteriological monitoring activities in 35 provinces with marine and coastal waters every year during the bathing season to protect the health of individuals and the public.

The number of monitored bathing areas in 2010 was 1,085, while in 2020 it was 1,402.

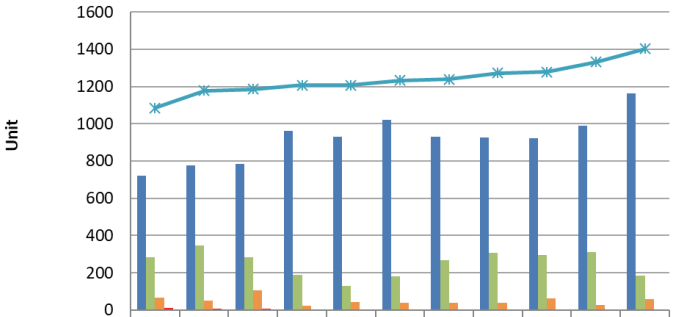
The "By Law on the Management of Bathing Water Quality Management", prepared in accordance with Directive 2006/7/ EC of the European Parliament and of the Council, entered into force upon publication in the Official Gazette on 25.10.2019 under number 30899. While the parameters of total coliforms, fecal coliforms and fecal streptococci in bathing waters in our country were monitored before 2020, the parameters of intestinal enterococci and E.coli will be monitored according to the new By Law.

According to the monitoring results in 2019, 990 bathing sites (74%), 313 bathing sites were assessed as B-class (24%) and 29 bathing sites were assessed as C-class (2%). In 2019, there is no bathing site that can be designated as D class.

In 2020, out of 1402 monitored bathing sites, 1161 bathing sites were classified as Class A (83%), 184 bathing sites as Class B (13%), and 57 bathing sites as Class C (4%). In 2020, there is not a single bathing site that can be designated as Class D.

According to the new directive, although the EU classification report has changed in 2020, since the bathing area profiles have not been finalised and have not been integrated into the bathing water quality system of the Ministry of Health, the classification assessment for 2020 was based on the new By Law parameters and class values after the abolished By Law classification. While in 2019, 74% of the monitored bathing sites in our bathing waters belonged to class A, in 2020 this percentage increased to 83%[47].

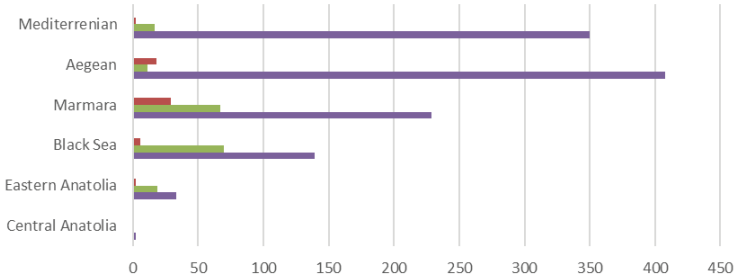
GRAPH 74- CHANGE OF BATHING AREA QUALITY CLASSES (2010-2020)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Class A	721	776	786	963	932	1021	932	926	921	990	1161
Class B	285	345	284	189	130	183	267	306	296	313	184
Class C	68	50	105	24	44	40	38	41	62	29	57
Class D	11	7	8	0	2	5	2	0	0	0	0
Monitored Bathing Area	1085	1178	1186	1208	1208	1232	1239	1273	1279	1332	1402

Source: Ministry of Health, General Directorate of Public Health, 2021

GRAPH 75- QUALITY CLASSES ACCORDING TO THE REGIONS FOR 2020



	Central Anatolia	Eastern Anatolia	Black Sea	Marmara	Aegean	Mediterrenian
D	0	0	0	0	0	0
C	0	2	6	29	18	2
B	0	19	70	67	11	17
A	2	33	139	229	408	350

Source: Ministry of Health, General Directorate of Public Health, 2021

6.8- Drinking and Utility Water Supplies of Municipalities

D P S I R

The indicator represents the pressure on the water supply. Dams are the most important and widely used water supply for municipalities. In years with low precipitation, water abstracted from dams for municipal water supply may decrease, and water abstracted from rivers, lakes, and ponds may increase.

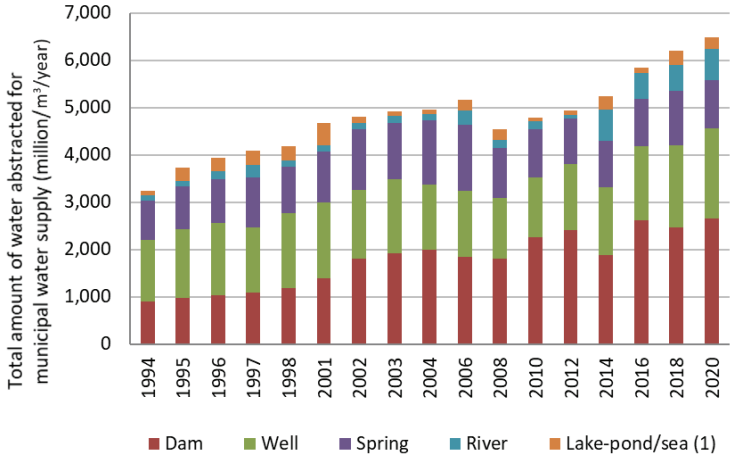
40.9% of water used for water supply in Turkey came from dams, 29.3% from wells, 15.6% from springs, 10.1% from rivers, and 4.0% from lakes/ponds/ponds in 2020.

The proportion of the municipal population served by water supply networks to the total municipal population was 98.7%, and the proportion of the municipal population served by water treatment plants to the total municipal population was 61.3% in 2020.

While in 1994, 3.24 billion m^3 of water was abstracted in 1994 to be distributed by municipalities through the water supply network, this number increased to 6.5 billion m^3 in 2020.

Of the total 6.5 billion m^3 of water abstracted for water supply networks, 3.9 billion m^3 was treated in drinking and utility water treatment plants. Of this, 93.1% was treated by conventional methods, 6.7% by advanced methods, and 0.2% by physical methods[48].

GRAPH 76- DISTRIBUTION OF WATER ABSTRACTED FOR MUNICIPAL WATER SUPPLY NETWORK BY SOURCES



The amount of water been abstracted from the sea since 2010 is included

Source: TURSTAT, "Sectoral Water and Wastewater Statistics" Press Release,2020

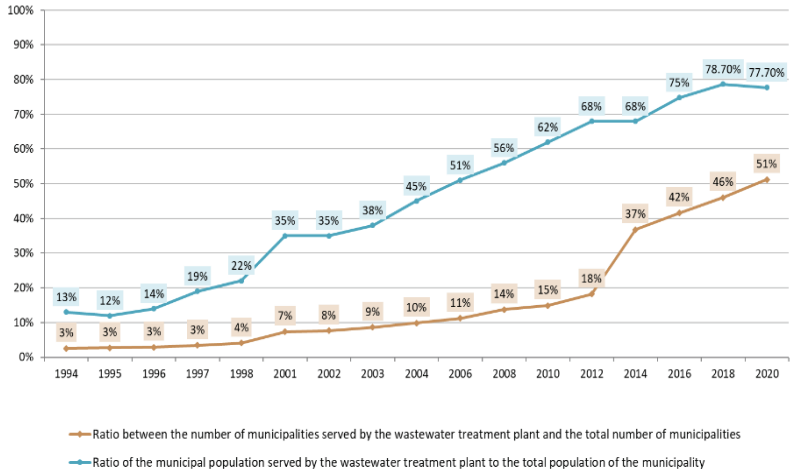
6.9- Municipalities Served by Wastewater Treatment Unit

D P S I R

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

Treatment of wastewater is an important practice to use water more efficiently and protect available water resources. As a result of the significant investments Turkey has made in this area, the percentage of municipalities served by wastewater treatment plants as a percentage of the total number of municipalities was 3% in 1994 and reached 51% in 2020. The percentage of the municipal population served by wastewater treatment plants reached 77.7% of the total municipal population[49].

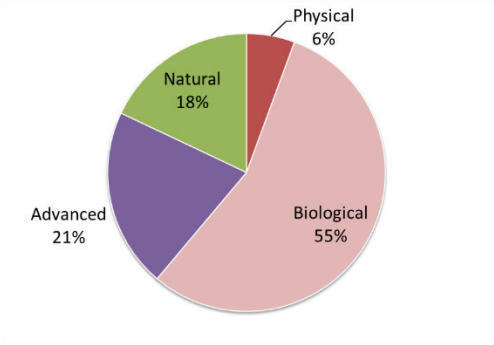
GRAPH 77- NUMBER OF MUNICIPALITIES AND RATE OF POPULATION SERVED BY WASTEWATER TREATMENT PLANTS (%)



Source: TURKSTAT, "Municipal Wastewater Statistics, 2020"

The total number of wastewater treatment plants, which was 145 in 2002, reached 1,068 at the end of 2020. Looking at the distribution of these plants, 21% of the wastewater treatment plants in our country are advanced wastewater treatment plants, 55% of them are biological wastewater treatment plants, 6% are physical wastewater treatment plants, and 18% are natural wastewater treatment plants.

GRAPH 78- DISTRIBUTION OF WASTEWATER TREATMENT PLANTS BY TYPES BY THE END OF 2020



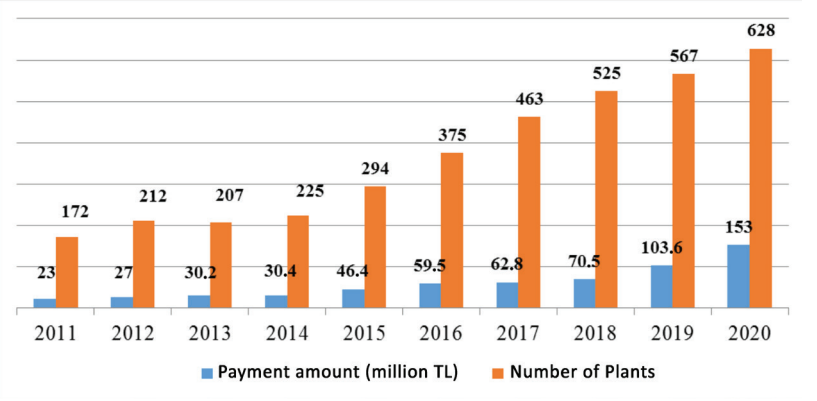
Source: TURKSTAT, "Water and Wastewater Statistics, 2020"

According to TURKSTAT, in 2020, 50.7% of wastewater in Turkey was treated with advanced processes, 27.1% with biological processes, 21.9% with physical processes, and 0.3% with natural processes[50].

According to TURKSTAT, it has been determined that 314 thousand tons of wastewater treatment sludge (on dry matter basis) will be generated in wastewater treatment processes in Turkey in 2020.

In general, the excessive energy demand of wastewater treatment plants increases operational costs and negatively affects the operation of the plant. In this context, the Ministry of Environment, Urbanisation and Climate Change submits Energy Incentive Repayment Certificate to the plants whose application has been approved under the "By-Law for Subsidizing the Energy Costs of Wastewater Treatment Plants" to cover 50% of the energy costs of wastewater treatment plants. In this regard, the Ministry of Environment, Urbanisation and Climate Change made a support payment of 153 million TL to 628 plants in 2020 to ensure the effective operation of wastewater treatment plants and to improve the quality of receiving waters.

GRAPH 79- ENERGY INCENTIVES FOR WASTEWATER TREATMENT PLANTS



Source: The Ministry of Environment, Urbanisation and Climate Change, General Directorate of Environmental Management, 2021

6.10- Municipalities Served by Sewerage Systems

D P S I R

The indicator is a response indicator that represents the percentage of the municipal population served by the sewerage system out of the total municipal population.

The share of the municipal population served by the sewerage system out of the total municipal population was set at 91.1% for the year 2020. The total number of municipalities is 1389 and the number of municipalities connected to the sewerage system is 1362 (98% of municipalities) in 2020.

The average daily per capita volume of wastewater discharged by municipalities through the sewerage system increased from 126 liters in 1994 to 189 liters in 2012[51].

GRAPH 80- RATIO OF POPULATION AND MUNICIPALITIES SERVED BY SEWERAGE SYSTEMS (%)

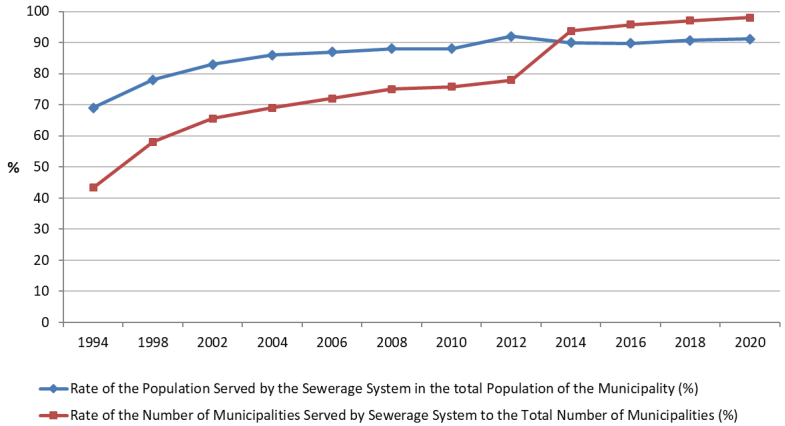


TABLE 11- RATIO OF POPULATION AND MUNICIPALITIES SERVED BY SEWERAGE SYSTEMS (%)

YEARS	1994	1998	2002	2004	2006	2008	2010	2012	2014	2016	2018	2020
Rate of Population Served by Sewerage Systems in the Total Population of the Municipality (%)	69	78	83	86	87	88	88	92	90	90	90.7	91.1
Rate of the Number of Municipalities Served by Sewerage System to the Total Number of Municipalities (%)	43	58	66	69	72	75	76	78	94	96	97	98
Average Daily Amount of Wastewater Discharged per Person (liter/capitaday)	126	154	154	174	181	173	182	190	181	183	188	189

Source: TURKSTAT, "Municipal Wastewater Statistics, 2020"

7 WASTE

7.1- Municipal Waste and Disposal Amounts

D P S I R

Primary prevention of waste generation, reduction of waste at source, waste recycling, energy recovery, and finally directing waste to disposal methods are general principles of waste management. Waste production volumes are pressure, their collection, disposal and recycling are response indicators.

Our Ministry has prepared the National Action Plan for Waste Management (NAPWM) (2016-2023), which has the task of establishing a policy and strategy for minimizing waste at source and its classification, collection, transportation, temporary storage, recycling, disposal, reuse, processing, conversion into energy and final disposal processes. The plan was created based on the principle of sustainability and takes into account international standards and national priorities to create a healthy and sustainable environment for present and future generations through the protection and development of our natural resources and ecosystems. The National Action Plan for Waste Management (2016-2023) was published in 2017. The aim of the publication of the plan is to reduce and limit the amount of waste sent to landfills as part of the circular economy and to set the targets for waste recovery, recycling, and energy generation needed to achieve the goals of an integrated waste management system in all 81 provinces.

According to the National Action Plan for Waste Management, 35% of waste generated should be recycled and 65% landfilled by 2023.

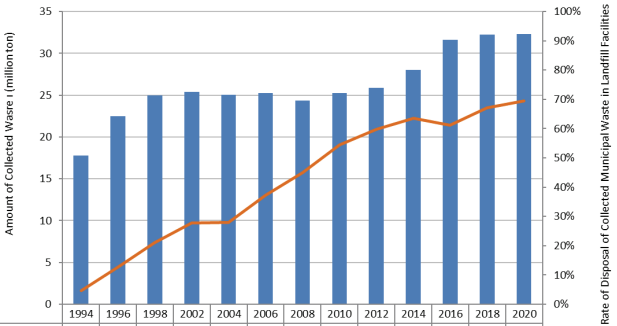
For the period 2023-2035, studies have been initiated to revise the NAPWM to harmonize existing management plans with the Zero Waste Management Plan, increase and expand the efficiency of source-separated collection, and identify recovery and disposal methods.

According to the Ministry of Environment, Urbanization and Climate Change, this figure is currently 22.4% in Turkey[52].

The average per capita generation of municipal waste in the EU-28 countries was 488 kg, while in our country it was 424 kg, according to 2018 EUROSTAT data[53].

The recycling rate for municipal waste averaged 48% in the EU-28 countries in 2019[54].

GRAPH 81- AMOUNT OF MUNICIPAL WASTE COLLECTED AND RATE OF SANITARY LANDFILLING BY YEARS



	1994	1996	1998	2002	2004	2006	2008	2010	2012	2014	2016	2018	2020
Collected Municipal Wastes	17.76	22.48	24.95	25.37	25.01	25.28	24.36	25.28	25.85	28.01	31.58	32.21	32.30
Rate of Disposal of Collected Municipal Waste in Landfill Facilities	4.6%	12.7%	21.1%	27.8%	28.0%	37.3%	45.0%	54.4%	59.9%	63.6%	61.2%	67.2%	69.41%

Source: TURKSTAT, "Waste Statistics Bulletin, 2020"

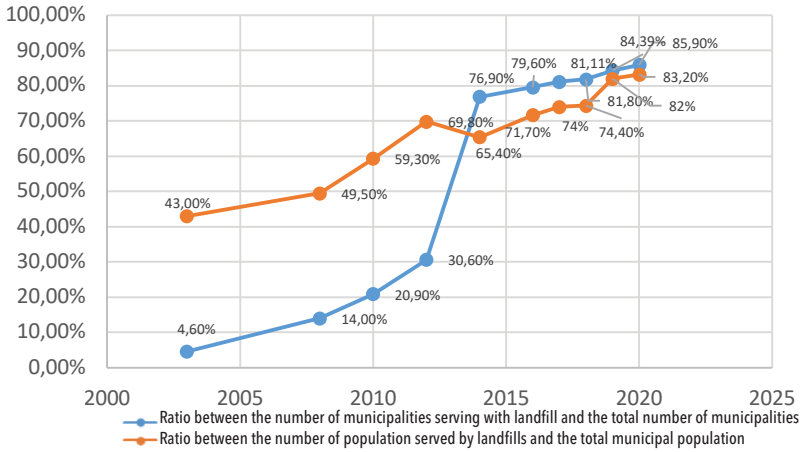
7.2- Number of Landfills - Number of Municipalities - Population Served by Landfills

D P S I R

The number of waste landfills, which was 15 by 2003, increased to 38 in 2008, 46 in 2010, 79 in 2014, 81 in 2015, 84 in 2016, 87 in 2017, and 88 in 2018, as a result of the studies for the establishment of solid waste disposal facilities in Turkey. 90 facilities serving 65.6 million people in 1194 municipalities in 2020.

According to the Ministry of Environment, Urbanization and Climate Change, the population served by landfills as a percentage of the total population of municipalities was 82,2% in 2020. The goal is to improve all existing infrastructure facilities and increase the percentage of the population served by waste disposal facilities to 100% by the end of 2023.

GRAPH 82- NUMBER OF MUNICIPALITIES AND RATE OF POPULATION SERVED BY LANDFILLS BY YEARS (%)



Source: The Ministry of Environment, Urbanisation and Climate Change, General Directorate of Environmental Management, 2021

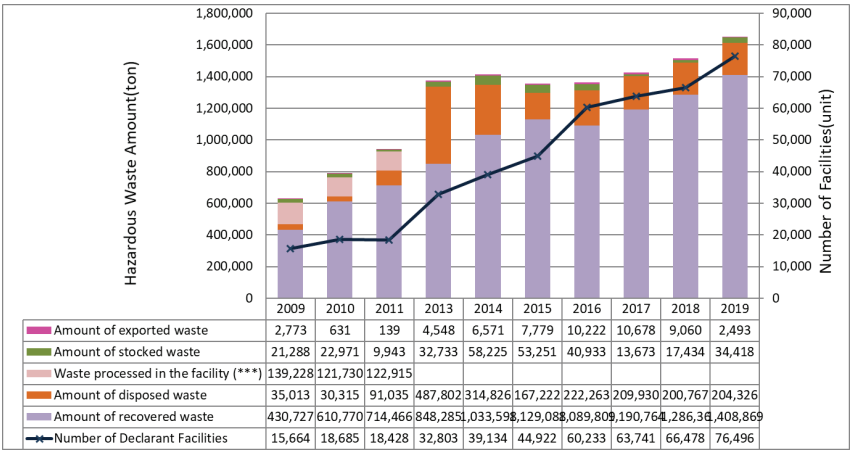
7.3- Hazardous Waste

D P S I R

Hazardous waste, especially from industrial plants, is an indicator of an important pressure factor in terms of environmental values.

Under the By-Law on Waste Management (BWM), annual waste declarations are made by waste producers using the Waste Management Application/Waste Declaration System (WDS) under the Integrated Environmental Information System (ecbs.cevre.gov.tr) of the Ministry of Environment, Urbanization and Climate Change. Hazardous waste data in the WDS consists of waste generator declarations and contains information about the hazardous waste generated by the waste generator at the facility during the reporting year and sent to the waste processing facility for recovery/disposal. The waste declarations provide information on the amount of hazardous waste generated throughout Turkey. By the end of 2019, 76,496 companies were using the Waste Declaration System (WDS). The amount of hazardous waste declared by these companies and generated throughout Turkey for 2019 was set at 1,650,106 tons. 85.74% of the 1,650,106 tons of waste was sent for recycling. 12.01% was disposed, 2.09% was stored, 0.15% was exported [55].

GRAPH 83- WASTE DECLARATION SYSTEM DATA (2009-2019)



	2009	2010	2011	2013	2014	2015	2016	2017	2018	2019
Amount of exported waste	2,773	631	139	4,548	6,571	7,779	10,222	10,678	9,060	2,493
Amount of stocked waste	21,288	22,971	9,943	32,733	58,225	53,251	40,933	13,673	17,434	34,418
Waste processed in the facility (***)	139,228	121,730	122,915							
Amount of disposed waste	35,013	30,315	91,035	487,802	314,826	167,222	222,263	209,930	200,767	204,326
Amount of recovered waste	430,727	610,770	714,466	848,285	1,033,598	1,129,088	1,089,809	1,190,764	1,286,361	1,408,869
Number of Declarant Facilities	15,664	18,685	18,428	32,803	39,134	44,922	60,233	63,741	66,478	76,496

TABLE 12- WASTE DECLARATION SYSTEM DATA (2009-2019) (**)

YEARS	2009	2010	2011	2013	2014	2015	2016	2017	2018	2019
Number of Declarant Facilities	15,664	18,685	18,428	32,803(*)	39,134	44.922	60,233	63,741	66,478	76,496
Total amount of hazardous waste (tons)	629,933	786,418	938,498	1,373,368	1,413,220	1,357,340	1,363,227	1,425,045	1.513.624	1,650,106

Source: The Ministry of Environment, Urbanisation and Climate Change, General Directorate of the EIA, Permit and Inspection, Waste Declaration System (WDS) Data

Notes:

Wastes generated during exploration, extraction, operation, and physical and chemical treatment of minerals listed in the list of wastes (code 01) were excluded from these quantities.

(**) Data for 2012 are not included here because the 2012 Hazardous Waste Statistics Bulletin was not published..

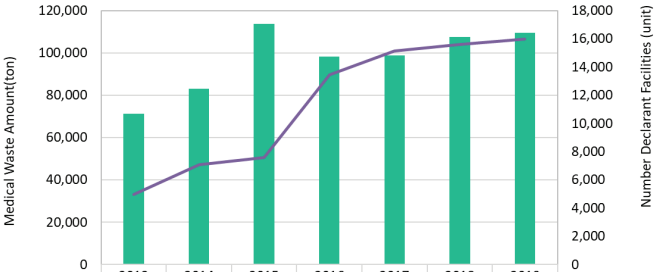
(***) The amount of waste processed at the facility was evaluated under the amount of waste recycled and disposed of according to the 2013 Statistics Bulletin.

7.4- Medical Waste

D P S I R

15,973 facilities declared on Waste Declaration System (WDS) in 2019, and the total amount of medical waste declared was 109,478 tons. This represented 7.1% of the total amount of hazardous waste (excluding mining waste). Medical waste has been successfully rendered harmless in the sterilization facilities and incinerators established in Turkey since 2008[56].

GRAPH 84 – MEDICAL WASTE ACCORDING TO WASTE DECLARATION SYSTEM DATA (2013-2019)



	2013	2014	2015	2016	2017	2018	2019
Amount of Medical Waste	71,173	83,190	113,857	98,376	98,729	107,400	109,478
Number Declarant Facilities	4,949	7,059	7,602	13,430	15,136	15,612	15,973

Source: The Ministry of Environment, Urbanisation and Climate Change, General Directorate of the EIA, Permit and Inspection, Waste Declaration System (WDS) Data

7.5- Waste Mineral Oils, Vegetable Waste Oils, Waste Batteries, Waste Accumulator, Waste Electrical and Electronic Equipment, End-of-Life Tires, and End-of-Life Vehicles

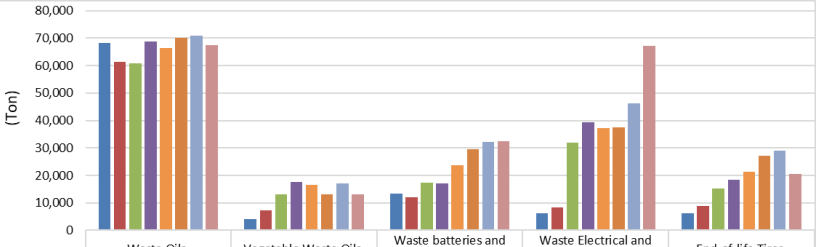
D P S I R

Under the By-Law on Waste Management (BWM), annual waste declarations are made by waste producers using the Waste Management Application/Waste Declaration System (WDS) under the Integrated Environmental Information System (ecbs.cevre.gov.tr) of the Ministry of Environment, Urbanization and Climate Change. Hazardous waste data in the WDS consists of waste generator declarations and contains information about the hazardous waste generated by the waste generator at the facility during the reporting year and sent to the waste processing facility for recovery/disposal. The quantities of waste oils, waste vegetable oils, waste batteries, waste accumulators,

waste electrical and electronic equipment, and end-of-life tires declared by waste producers to the Waste Declaration System for the period 2013-2020 are shown in Graph 85.

The quantities of end-of-life vehicles for the period 2013-2020 recorded in the General Directorate of Environmental Management, End-of-Life Vehicles Disposal Tracking System (ELV System) are shown in Graph 86.

GRAPH 85– THE QUANTITY OF COLLECTED WASTE MINERAL OIL, VEGETABLE WASTE OIL AND NUMBER OF WASTE BATTERIES AND ACCUMULATORS, WASTE ELECTRICAL AND ELECTRONIC GOODS, END-OF-LIFE TIRES, AND END-OF-LIFE VEHICLES (2013-2020)



	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

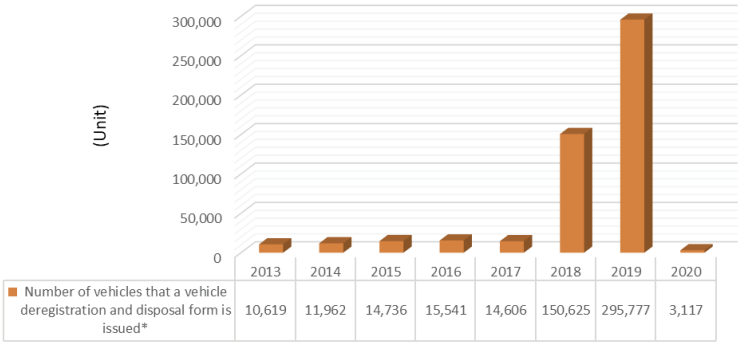
Source: The Ministry of Environment, Urbanisation and Climate Change, General Directorate of Environmental Management, Waste Declaration System (WDS) Data

Notes:

Data updated to include hazardous and non-hazardous waste codes in waste groups as of 2019.

*From 2021, the Waste Oil Group will apply the Regulation amending the By-Law on Waste Oil Management and the List of Wastes annexed to the Regulation, published in the Official Gazette of 23/12/2020 under number 31343.

GRAPH 86– NUMBER OF VEHICLES THAT A VEHICLE DEREGISTRATION AND DISPOSAL FORM IS ISSUED (2013-2020)



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

Note: Between 03/27/2018 and 12/31/2019, the scrappage incentive, which provides for a reduction in the Special Consumption Tax, was applied for new vehicles to be purchased.

7.6- Mining Waste

D P S I R

According to TURKSTAT, 812 million tons of waste were generated in mining enterprises in 2018. Mineral waste accounted for 99.9% of the total mining waste. It was found that 97.9% of mineral wastes were pickling material/tails.

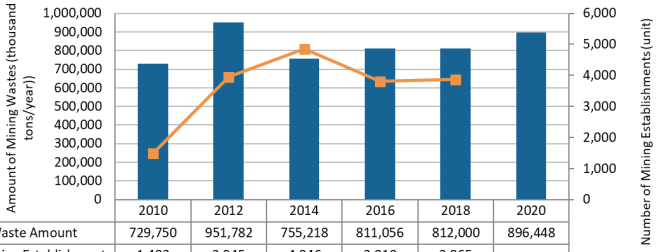
Looking at the distribution of total mining waste by recovery and disposal methods in 2020, 71.3% was disposed of in tailings piles, tailings dams, or landfills, 26.4% was backfilled in quarries, and 2.3% was recovered or disposed of in other ways[57].

TABLE 13- NUMBER OF MINING WASTE LANDFILLS

YEARS	2011	2012	2013	2014	2015	2016	2017	2018	2020
Number of Mining Waste Landfills	6	17	25	32	34	36	39	51	61

Source: The Ministry of Environment, Urbanisation and Climate Change, General Directorate of Environmental Management,2021

GRAPH 87- MINING WASTE BY YEARS



	2010	2012	2014	2016	2018	2020
Total Mining Waste Amount	729,750	951,782	755,218	811,056	812,000	896,448
Number of Mining Establishments	1,482	3,945	4,846	3,810	3,865	

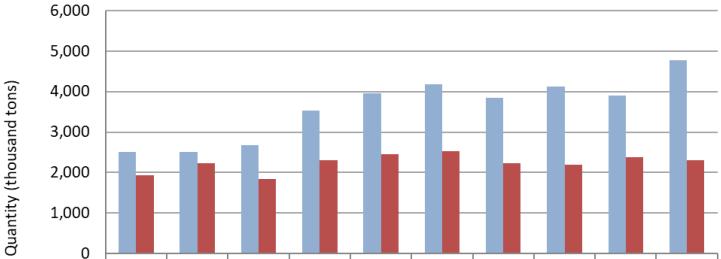
Source: TURKSTAT, "Waste Statistics 2020"

7.7- Packaging Waste

D P S I R

According to the polluter-pay principle in the By-Law on Packaging Waste Control (PWC), the responsibility for bearing the cost of collecting packaging waste is assigned to the enterprises that place their products on the market in packaged form, and it is of great importance that these enterprises are registered.

GRAPH 88- AMOUNT OF PACKAGING RELEASED TO THE MARKET BY YEARS AND AMOUNT OF RECOVERED PACKAGING WASTE ACCORDING TO THE PACKAGING WASTE DECLARATION SYSTEM



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Amount of packaging released to the market	2,516	2,511	2,684	3,529	3,948	4,183	3,851	4,128	3,893	4,772
Amount of recycled packaging waste	1,938	2,225	1,834	2,300	2,453	2,531	2,226	2,199	2,375	2,300

TABLE 14- RESULTS OF PACKAGING AND PACKAGING WASTE PRODUCED AND RELEASED TO THE MARKET IN 2019

Waste Code	Waste Type	Produced Packaging Amount (ton)	Under B-1 (1)			Released to the market (ton) Under B-2 (2)	Supplied (ton) Under C(3)
			Released to the market (ton)	Recovered (ton)	Actual Recovery Rate (%)		
15.01.02	PLASTIC	3,009,487	1,037,558	586,832	57	95,226	19,053
15.01.04	METAL	385,941	132,524	71,234	54	89,601	15,728
15.01.05	COMPOSITE	300,266	104,439	60,749	58	13,039	0
15.01.01	PAPER/ CARDBOARD	4,023,3994	2,065,781	1,125,613	54	25,134	11,538
15.01.07	GLASS	1,608,669	871,426	276,037	32	36,337	149,926
15.01.03	WOOD	670,125	561,259	180,229	32	2,929	85,052
	TOTAL	9,998,483	4,772,988	2,300,693	48	262,266	281,327

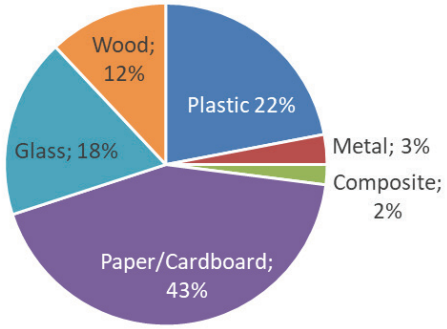
(1) B-1: Packages disposed of under By-Law on CPW

(2) B-2: Packages disposed of under the legislation other than By-Law on CPW

(3) C: Packages released to the market with a deposit under By-Law on CPW

Source: The Ministry of Environment, Urbanisation and Climate Change, General Directorate of Environmental Management,2021

GRAPH 89- THE RATES OF PACKAGES IN THE MARKET UNDER B-1 IN 2019 ACCORDING TO THEIR TYPES

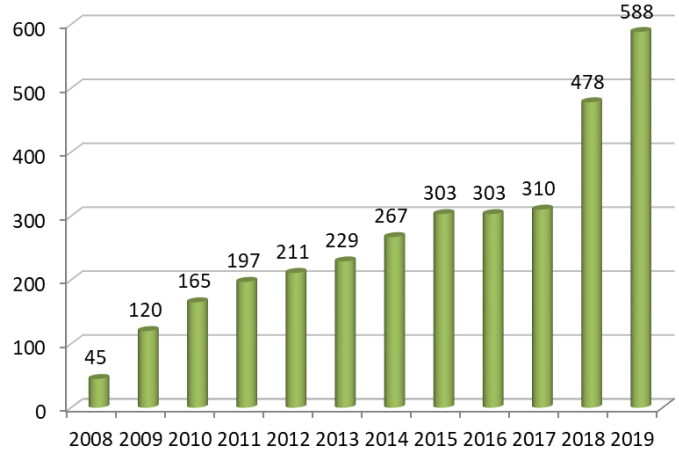


Source: The Ministry of Environment, Urbanisation and Climate Change, General Directorate of Environmental Management,2021

Municipalities are obliged to collect or have collected packaging waste in accordance with By-Law. They shall prepare packaging waste management plans showing by whom, how and when packaging waste will be collected and transported separately from

other waste at source and submitted to the Ministry. In the context of these studies, conducted for the first time in 2008, the number of municipalities that prepared and submitted their plans to the Ministry in accordance with the packaging waste management plan format and whose plans were approved is shown in Graph- 90.

GRAPH 90- NUMBER OF MUNICIPALITIES WITH PACKAGING WASTE MANAGEMENT PLAN



Source: The Ministry of Environment, Urbanisation and Climate Change, General Directorate of Environmental Management,2021

Note: Municipalities were reorganized under Law No. 6360.

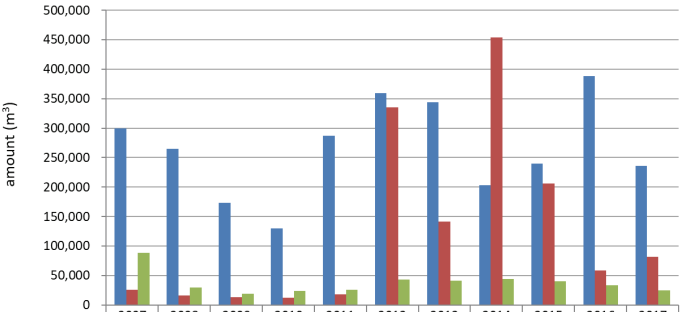
7.8- Ship-Sourced Waste Amounts

D P S I R

In order to prevent waste and cargo residues produced by ships under maritime jurisdiction from entering the sea for the protection of the marine environment, waste management facilities are established and operated in accordance with the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), to which Turkey is a party, and national legislation. In 2020, there were 305 near-shore facilities providing waste to ships in Turkey. In September 2021, this number reached 322.

Waste collected at the port waste reception facilities is sent for recovery/disposal in accordance with the maritime legislation as per Environmental Law. This will reduce the marine pollution caused by ships due to increasing maritime traffic.

GRAPH 91- DISTRIBUTION OF SHIP-SOURCED WASTES BY YEARS (m^3)



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Oil and Oil Derived Wastes	299,960	264,954	173,571	129,483	286,712	359,505	343,585	203,041	240,046	388,311	236,004
Sewaga	25,481	15,934	12,777	11,947	17,583	335,530	141,695	453,718	206,429	58,950	81,585
Garbage	88,038	29,950	18,653	23,977	25,255	43,177	41,039	44,007	40,067	33,872	24,514

Source: The Ministry of Environment, Urbanisation and Climate Change, General Directorate of Environmental Management,2021

7.9- Zero Waste Management System

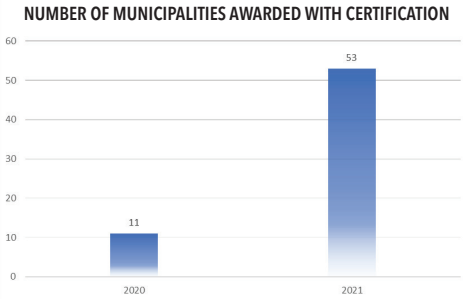
D P S I R

The Zero-Waste approach is an environmental movement that works to leave future generations a clean and developed Turkey and a livable world, and to protect our raw material resources and energy savings within the principles of sustainable development by avoiding and reducing the generation of waste, preventing waste, and collecting and recycling it separately at the source.

The By-Law on Zero Waste, which aims to introduce, implement and disseminate the waste prevention approach throughout the country by establishing the general principles and application principles for the establishment of the "Zero Waste Management System" under the Zero Waste Project, entered into force upon publication in the Official Gazette on 12/07/2019 under number 30829.

Starting January 12, 2020, the Zero Waste Certificate will be awarded to local governments that have implemented a Zero Waste Management System. A Basic Level Zero Waste certificates were awarded to the residential areas of 53 municipalities.

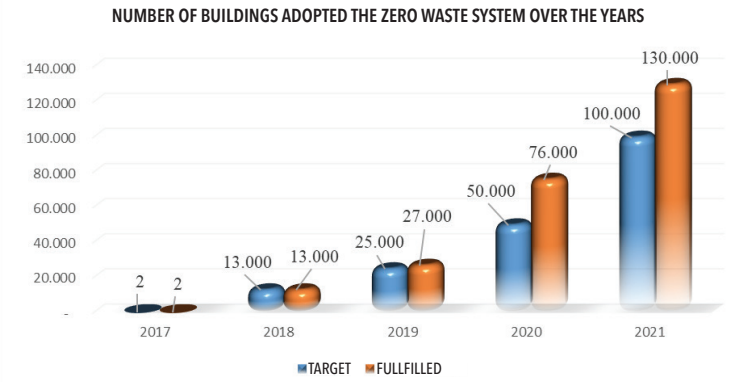
GRAPH 92- NUMBER OF MUNICIPALITIES AWARDED WITH CERTIFICATION FOR THEIR SERVICE AREAS OVER THE YEARS



Source: The Ministry of Environment, Urbanisation and Climate Change, General Directorate of Environmental Management,2021

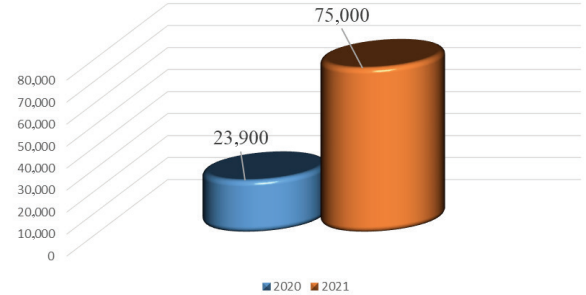
The Zero Waste project introduced practices that were adopted by all areas. In the period from June 2017, when implementation began, to 2021, work has begun to implement a zero waste management system in 130,000 institutional/organizational buildings across Turkey, particularly in the Presidential Complex, the Grand National Assembly of Turkey, and the Provincial Directorates of Environment, Urbanization and Climate Change in 81 provinces. By 2021, the number of buildings and facilities for which documents have been issued has reached 75,000.

GRAPH 93- NUMBER OF BUILDINGS ADOPTED THE ZERO WASTE SYSTEM OVER THE YEARS



Source: The Ministry of Environment, Urbanisation and Climate Change, General Directorate of Environmental Management,2021

GRAPH 94- NUMBER OF CERTIFIED BUILDINGS AND FACILITIES BY YEAR

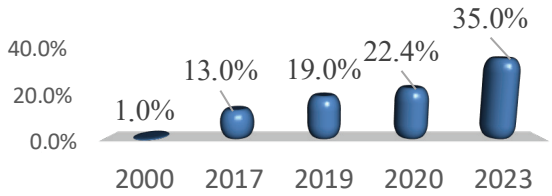


Source: The Ministry of Environment, Urbanisation and Climate Change, General Directorate of Environmental Management,2021

In 2020, 4 million tons of paper, 1.1 million tons of plastic, 470,000 tons of glass, 75,000 tons of metal, 280,000 tons of wood, 80,000 tons of textiles, 18,000 tons of waste vegetable oil, 19,000 tons of electrical and electronic equipment, and 1.2 million tons of organic and mixed recyclable waste were collected separately at source and recycled.

In 2020, 7.2 million tons of waste were recycled, and the recycling rate, which was 19% in 2019, was increased to 22.4% in 2020, and the target is to increase this rate to 35% by 2023.

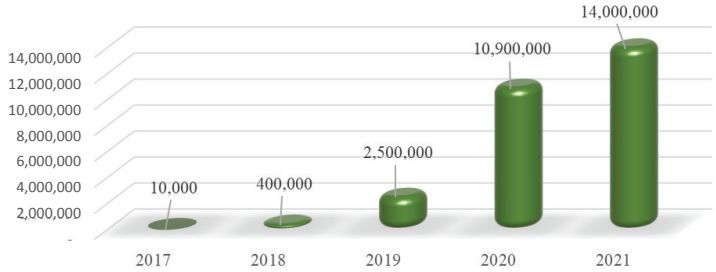
GRAPH 95- RECYCLING RATES BY YEARS



Source: The Ministry of Environment, Urbanisation and Climate Change, General Directorate of Environmental Management,2021

In 2018, a Zero Waste Information System was established to collect data, create an inventory, monitor work performed, generate reports, and conduct the Zero Waste documentation process. The users of the Zero Waste Information System are local governments, public institutions, educational institutions, health institutions, tourism institutions, ports, terminals, airports, gas stations, market chains, business centers, and tradesmen. The number of registered users of the Zero Waste Information System has reached 140,000. 14,000,000 people have been trained in waste prevention to date.

GRAPH 96- NUMBER OF PERSONS TRAINED BY YEARS



Source: The Ministry of Environment, Urbanisation and Climate Change, General Directorate of Environmental Management,2021

8

LAND

8.1- General Distribution of Land Cover

D P **S** I R

The indicator is a state indicator, and it is important to have an accurate knowledge of the general distribution of land cover in order to balance land use planning with monitoring of current and potential developments in this area and to limit the pressure of activities such as urbanization and industrialization on natural areas.

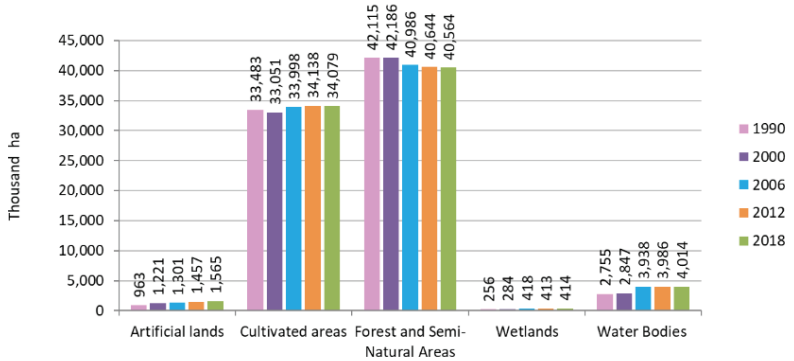
Under the CORINE (Coordination of Information on the Environment - Environmental Information Order) program on land cover, which is one of the land management projects of the European Union, CORINE projects were implemented in Turkey in 1990, 2000, 2006, 2012 and 2018.

According to CORINE data of 2018, the share of artificial land in Turkey is 1.94%, while agricultural land is 42.26%, forest and semi-natural land is 50.31%, wetlands are 0.51%, and water bodies are 4.98%.

While forests and semi-natural lands in Turkey have decreased by 1,550,586 ha between 1990 and 2018, all other lands have increased, such as artificial lands by 602,640 ha, agricultural lands by 596,041 ha, water bodies by 1,258,936 ha, and wetlands by 157,479 ha. Growing population, urbanization and industrialization are factors that put pressure on agricultural lands and natural areas.

Looking at the situation in the EU-28 countries, forests and other wooded land accounted for more than one-third (37.8%) of the total area of the EU-28 in 2015, while cultivated land (22.2%) and pastureland (20.7%) accounted for more than one-fifth of the total area. Shrubs covered 7.1% of the total area. Artificial land accounted for 4.2% of the EU-28 total area, bare land for 3.3%, water areas for 3.0%, and wetlands for 1.7%[58].

GRAPH 97- LAND USE BY YEARS (1990-2018)



Source: http://corinecbs.tarimorman.gov.tr/corine

8.2- Misuse of Agricultural Areas

D P S I R

The indicator is a pressure indicator. Increasing population, urbanization and industrialization exert pressure on agricultural land and affect agricultural land.

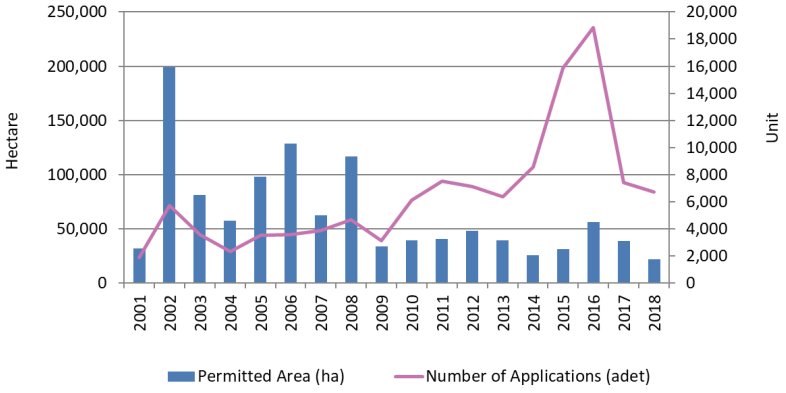
Between 1989 and 2018, the non-agricultural use of a total of 2,604,517 hectares of agricultural land was approved in Turkey.

Looking at the class distribution of 722,488 hectares of nonagricultural land permitted for nonagricultural use between 2005 and 2018, 63.9% was marginal agricultural land and 23.7% was absolute agricultural land.

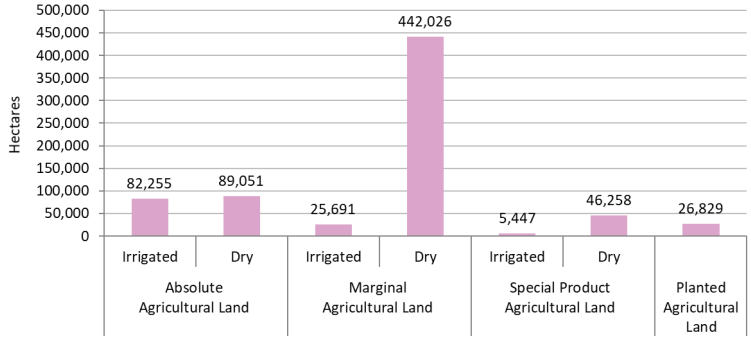
A total of 6,695 permit applications for non-agricultural uses were submitted, and 21,513 hectares of land were granted a permit for non-agricultural use in 2018[59].

Law No. 5403 on Soil Conservation and Land Use contains provisions to protect irrigated and fertile agricultural land and to prevent the opening of agricultural land except for marginal agricultural land for construction, unless there is an obligation to do so.

GRAPH 98- MISUSE OF AGRICULTURAL LAND UNDER THE LAW NO. 5403 ON SOIL CONSERVATION AND LAND USE (2001-2018)



GRAPH 99- DISTRIBUTION OF LANDS PERMITTED FOR MISUSE BY CLASS BETWEEN 2005 AND 2018



Source: Ministry of Agriculture and Forestry, General Directorate of Agricultural Reform, 2019

8.3- Zones at Risk of Erosion

D P **S** I R

The indicator is a state indicator that indicates the erosion-prone zones and the degree of erosion. Turkey is highly vulnerable to erosion due to its geographical location, climate, topography, geological structure and soil characteristics. However, man's improper interference with nature and overuse of natural resources further exacerbate erosion.

Studies on monitoring and evaluation of water and wind erosion on the soils of Turkey were initiated by the General Directorate of Combating Desertification and Erosion and advised by Ankara University, Faculty of Agriculture. In this context, two predictive models named "Dynamic Erosion Model and Monitoring System" (DEMİS) and "National Dynamic Wind Erosion Model and Monitoring System" (UDREMİS) were developed.

According to the data obtained using the Dynamic Erosion Model and Monitoring System, a maximum of 642 million tons of soil are displaced annually by water erosion. On average, 8.24 tons of soil per hectare are displaced annually by water erosion. If this amount is classified according to the area of our country, the distribution is 60.28% as very low, 19.13% as low, 7.93% as moderate, 5.97% as severe and 6.7% as very severe.

When examining the equality parameters, 14.26% precipitation, 3.36% soil, 47.55% topography and 34.82% vegetation are responsible for the spatial and quantitative changes of soil loss in our country.

Looking at land use, 38.71% of the displaced land in our country is agricultural land, 4.17% is forest land, and 53.66% is pasture land[60].

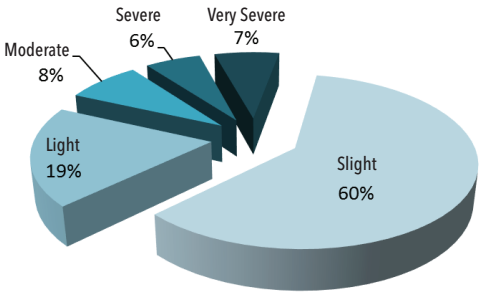
The amount of suspended soil in our rivers is measured by stations of the Ministry of Agriculture and Forestry, General Directorate of State Hydraulic Works. According to the measurement results, 154 million tons of soil are transported through our rivers. This means that about 2 tons of soil per hectare per year are transported through the rivers.

TABLE 15 - AREAS AND SEVERITY GRADES OF WATER AND WIND EROSION

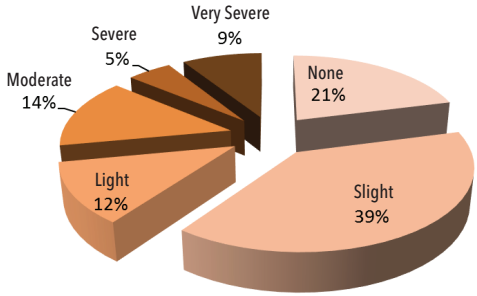
	ERZ – EROSION SEVERITY GRADE	AREA (million ha)
WATER EROSION	Slight	387
	Light	123
	Moderate	51
	Severe	38
	Very Severe	43
WIND EROSION	None	3.56
	Slight	6.78
	Light	1.99
	Moderate	2.36
	Severe	0.95
	Very Severe	1.49

Source: General Directorate of Combating Desertification and Erosion 2019

GRAPH 100- DISTRIBUTION OF WATER EROSION GRADES



GRAPH 101- DISTRIBUTION OF WIND EROSION GRADES

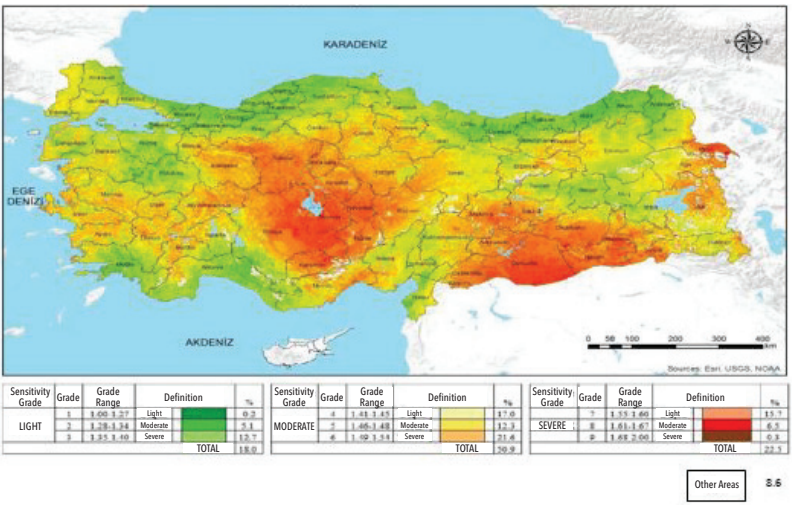


The Basin Monitoring and Evaluation System (HIDS project), carried out in collaboration with TUBITAK and the General Directorate of Combating Desertification and Erosion, determined 7 main criteria as part of the work package to create the Desertification Model and Vulnerability Map of Turkey. For these seven main criteria, 48 indicators and 37 sub-indicators were defined. Criteria are ranked in order of importance as Climate, Water, Soil, Land Cover and Land Use, Topography and Geomorphology, Socio-economics and Management.

TABLE 16- CRITERIA AND INDICATORS OF THE DESERTIFICATION MODEL OF THE TURKEY

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

HARİTA 5- DESERTIFICATION RISK MAP OF TURKEY



Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Combating Desertification and Erosion, 2021

In a general assessment according to the Desertification Risk Map, one of the most important studies on desertification and land degradation in Turkey, 22.5% of Turkey is highly sensitive to desertification, 50.9% is moderately sensitive, and 18% is slightly sensitive. Turkey is susceptible to desertification. 8.6% of Turkey's area belongs to the other area classes (1750 m and higher, 'Glaciers and Permanent Snow', 'Rocks' and 'Areas with Sparse Vegetation').

In the Desertification Sensitivity Map of Turkey, which was prepared in accordance with the desertification criteria and indicators established in the Desertification Model of Turkey at the national level, the percentage distribution of desertification sensitivity in each basin was determined in detail. Looking at the Turkey's large hydrological basins, at least 15% of all river basins, with the exception of the Aras, Western Black Sea, Konya Closed, Marmara and Meriç-Ergene basins, belong to the moderate to severe desertification sensitivity combination group. The basins predicted to have severe to slight sensitivity to desertification over at least 15% of their land are as follows: Akarçay, Burdur, Büyük Menderes, Eastern Mediterranean, Eastern Black Sea, Fırat-Dicle, Konya Closed, Kızılırmak, Küçük Menderes, Sakarya and Seyhan.Although the percentages are slighter, severe to moderate desertification sensitivity was found on at least 5% of the area of all basins only in the Akarçay, Burdur, Eastern Mediterranean, Eastern Black Sea, Fırat-Dicle, Konya Closed, Kızılırmak, Sakarya and Seyhan basins.

The project " Desertification Model of Turkey" is to be extended to the countries of Central Asia, Africa and the Mediterranean region with a holistic and interdisciplinary approach[61].

9
BIODIVERSITY

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

D P S I R

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

The Mediterranean and Near East Centers, which are the centers of plant diversity and origin overlap with Turkey and host many centers of genetic diversity of various crops.

Our country has a position that can be considered quite rich in plant species, especially considering its climatic zone. In the group of flowering plants (Angiospermae), the proportion of endemism among seed plants is very high. Of the 11 000 species and subspecies of flowering plants, 3925 are endemic, and the endemism rate is about 34%.

Among the seedless plants, the most famous plant group is ferns (Pteridophtyes). In Turkey, 101 fern species and subspecies have been counted, of which only 3 are endemic[62].

Although Turkey is a very rich country in terms of endemic plants, some of these rich species are seriously threatened. According to the IUCN 2001 criteria, about 600 of our endemic species are in the Very Endangered category CR" and about 700 are in the Endangered category EN".

TABLE 17- 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
Bryophytes	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 Biological Diversity Strategy and Action Plan 2007

Turkey has a rich and special status in terms of fauna due to its geographical location. It has been found that 481 species of birds, 161 species of mammals, 141 species of reptiles and amphibians, 480 species of marine fishes and 236 species of freshwater fishes live in our country.

Of the 141 reptile and amphibian species in Turkey, 16 are endemic and 10 are threatened. There are no endemic bird species in Turkey. However, 5 species and 32 subspecies of mammals, 16 species and/or subspecies of reptiles and 70 species/ subspecies of freshwater fishes are endemic.

Although the invertebrate fauna is not as well known as the vertebrate fauna, it is known that 30,000 species have been identified, while the total number of species is estimated at about 60,000-80,000.

In the marine areas of Turkey, 10 marine mammal species have been recorded. Despite the 21 marine mammal species that regularly or occasionally enter the Mediterranean in the Mediterranean basin, only 3 species live in the Black Sea. It is noted that the Mediterranean monk seal (Monachus monachus) has not been seen in the Black Sea since 1994.

TABLE 18- NUMBER FROM TAXONS INCLUDE TO VARIOUS TYPES FROM SPECIES AND SUBSPECIES, STATE FROM ENDEMISM, RARE AND ENDANGERED SPECIES AND EXTINCT SPECIES

Animal Groups	Defined Species	Endemic Species/ Subspecies Variety	Rare/ Endangered Species	Extinct Species
VERTEBRATES				
Reptiles/Amphibian	141	16	10	-
Birds	460		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 Biological Diversity Strategy and Action Plan 2007

As far as biodiversity is concerned, Turkey has the characteristics of a small continent. The reasons for this can be enumerated as follows: The presence of three different bioclimatic types, the presence of three phytogeographical regions such as Euro-Siberia, Mediterranean and Iran-Turania, which have topographical, geological, geomorphological and soil diversity, including different wetland types (sea, lakes, rivers and fresh, salty and sodic lakes, etc.), altitude differences of 0-5,000 m, deep canyons and very different ecosystem types, less affected by the Ice Age than the European countries connecting the North Anatolia region with the South Anatolia region, and the resulting ecological and floristic differences, as well as the location at the confluence of three continents. In summary, Turkey has agricultural, forest, mountain, steppe, wetland, coastal, and marine ecosystems, as well as various forms and combinations of these ecosystems.

To identify this biological wealth, biodiversity inventory studies were started in 2013 under the National Biodiversity Inventory and Monitoring Project at the provincial level, and by the end of 2019, the studies had been completed for 81 provinces. This project established monitoring indicators at the species/population, habitat/ecosystem, and regional levels for each province and developed monitoring plans. The project established at the local level the initial parameters of the "National Monitoring Programme," which will bring monitoring studies in our country to a national level for the first time.

As of today, monitoring studies are carried out in areas of concern for endangered species and biodiversity identified by the project [63].

TABLE 19- THE TAXON INFORMATION ON THE SPECIES AND SUBSPECIES BY GROUP

Living Species	Taxon number of species and subspecies
Amphibian	39
PLants	12,141
Inland fishwater	403
Birds	500
Mammals	175
Reptiles	146

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

TABLE 20- NUMBER OF BIO-SMUGGLING CASES DETECTED BY YEARS (2007-2018)

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

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

9.2- Invasive Alien Species

D P S I R

This indicator is a pressure indicator because invasive alien species pose a threat to indigenous species and habitats.

While the number of alien species in our seas was 263 in 2005, this number increased to 422 in 2011 and reached 540 in 2018, 105 of which are invasive.

Although the vast majority of invasive alien species in the Mediterranean are introduced through the Suez Canal, a significant number of invasive alien species in the Black Sea are transmitted through the ballast water of vessels.

By 2020, 780 alien species have been detected in terrestrial environments and inland waters. Of these, 146 are invasive alien species, representing 19% of all alien species[64].

TABLE 21- ALIEN SPECIES IN TERRESTRIAL ENVIRONMENTS AND INTERNAL WATERS

	Alien Species	Invasive Alien species
Fish	23	5
Herpetofauna	1	1
Bird	9	3
Herb	450	107
Mammal	4	4
Invertebrate	293	26
TOTAL	780	146*

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

* rate of invasive alien species 19%

9.3- Protected Areas

D P S I R

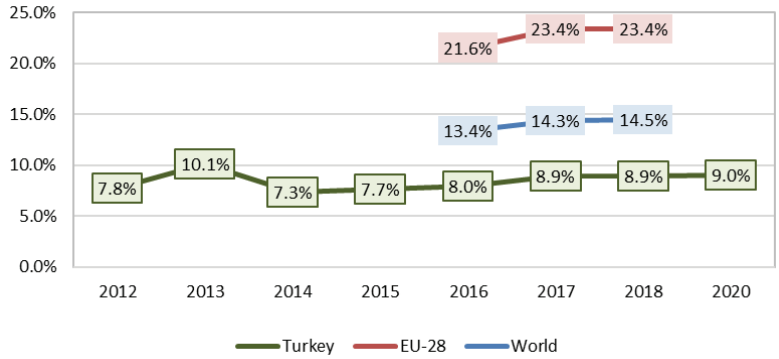
The indicator is a response indicator. Conservation of biodiversity and natural resources is sought through protected areas.

In 2020, the share of total protected areas (terrestrial and marine) under the responsibility of the Ministry of Agriculture and Forestry and the Ministry of Environment, Urbanization and Climate Change of the General Directorate for Protection of Natural Assets in the national area is 9.0%. Pastures, drinking water basins and forest areas

allocated as nature protection function outside the protected area (total forest, forest land, pastures, stone areas) are not included in the calculations of protected areas.

While the rate of protected areas was 7.8% in 2012, it was 7.3% in 2014 and 9.0% in 2020[65]. The main reason for the decrease in 2014 is the amendment made in 2014 to the "By-Law on Wetlands ", which introduced the registration procedure for wetlands.

GRAPH 102- THE PERCENTAGE OF TERRESTRIAL AND MARINE PROTECTED AREAS IN TOTAL TERRESTRIAL AREA OF TURKEY (%)



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) The registration process was introduced for wetlands with the amendment in By-Law on Wetlands in 2014.

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

(3) For the total calculations, the percentages were calculated from the ratio of the area from terrestrial and marine protected areas to the Turkish land area. The ratio is based on a uniform area of 77,998,600 hectares in Turkey.

TABLE 22- STATUS AND AREAL DISTRIBUTION OF PROTECTED AREAS IN TURKEY

YEARS	2013		2020	
The Ministry of Agriculture and Forestry, Protected Areas	Number (unit)	Area (ha)	Number (unit)	Area (ha)
National Park	40	848,203	45	907,519
Nature Park	192	90,218	250	107,632
Nature Conservation Area	31	64,243	31	46,461
Nature Monument	112	6,684	115	9,393
Wildlife Conservation Area	80	1,191,340	84	1,158,820
Wetland (of International Importance)	135	3,215,500		
Wetland of Local Importance (1)			13	14,513
Ramsar Areas (1)			14	184,487
Wetlands of National Importance (1)			59	869,697
Protection Forests	55	320,451	54	247,708
Honey Forests	200	24,861		
City Forests	128	11,722	134	10,089
Gene Conservation Forests (in-situ)	257	47,978	336	43,120
Seed Stands (in-situ)	351	47,063	318	41,880
Seed Stands (ex-situ)	179	1,414	207	1,506
TOTAL OVERLAPPING	**1,760**	**5,373,162**	**1,660**	**3,642,826**
Ministry of Environment, Urbanization and Climate Change Protected Areas	**Number (unit)**	**Area (ha)**	**Number (unit)**	**Area (ha)**
Specially Protected Environment Areas (SPA)	16	2,459,116	18	2,601,568
Natural Sites	1,273	1,322,749	2,835	1,985,543
GENERAL TOTAL OVERLAPPING	3,049	7,883,511	4,537	7,008,717
Ratio of protected areas in the Country's total surface area (%) (3)		**%10.1**		**%9.0**

Sources: Ministry of Agriculture and Forestry; General Directorate of Nature Conservation and National Parks, Nature Conservation Status Reports, http://www.milliparklar.gov.tr/docs/default-source/default-document-library/tkdr_tr_2018_30-05-2019. pdf?sfvrsn=0

Notes:

(1) The registration process was introduced for wetlands with the amendment in By-Law on Wetlands in 2014.

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

(3) For the total calculations, the percentages were calculated from the ratio of the area from terrestrial and marine protected areas to the Turkish land area. The ratio is based on a uniform area of 77,998,600 hectares in Turkey.

9.4- Protected Coastline Length

D P S I R

The indicator is a response indicator. Coastline areas are facing greater pressures from human activity and climate change. The goal is to mitigate these impacts and protect biodiversity. The total coastline length of Turkey, excluding islands, is 8592 km. The protected coastline length is 2,110 km, which is 24% (as of 2020)[66].

TABLE 23- PROTECTED COASTLINE LENGTH OF TURKEY

YEARS	2002	2012	2013	2014	2015	2016	2017	2018	2019	2020
Protected Coastline Length of Turkey (km)	1775	1853	1855,3	1855,3	1860	1865	1957	1957	2083	2110
Ratio of Protected Coastline Length to Total Coastline Length (%)	20	22	22	22	22	22	23	23	24	24

Source: "Status Reports on Nature Conservation 2020", Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks,2021

9.5- Wildlife Conservation Activities

D P S I R

The indicator is a response indicator for biodiversity conservation. 481 species of birds, 150 species of mammals and 130 species of reptiles have been placed under protection by the Ministry of Agriculture and Forestry General Directorate of Nature Conservation and National Parks. 20 Species Action Plans were completed in 2019, and action plans have been prepared for 100 species to date.

81 Wildlife Development Areas have been declared by the decision of the Council of Ministers for the protection of endangered wildlife in our country. A regular inventory of species in these areas, is conducted every year. In these areas, rupicapra rupicapra ornate, Anatolian wild sheep, wild goat, gazelle, red deer, fallow deer, roe deer, great bustard, ptarmigan, black vulture and bald Ibis, hyena, grizzly bear, wolf, otter (lutra) and waterfowl are protected. Stations are established to breed these animals, and adult animals are released back into the wild in suitable habitats to breed endangered wildlife species.

Investigations are carried out within the framework of the CITES Convention to prevent the illegal trade in endangered wildlife[67].

TABLE 24- WILDLIFE CONSERVATION ACTIVITIES

YEARS	2012	2013	2014	2015	2016	2017	2018	2019	2020
The number of wild mammals propagated and released in the nature	62	84	148	114	36	21	27	0	181
The placement numbers of the winged wild animals (Partridge - Pheasant	64,895	79,200	91,050	97,200	103,100	92,000	97,500	95,000	107,000
The placement numbers of trout population 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
Total Number of Wildlife Propagation Facilities (Partridge, Pheasant, Mammals, Bald Ibis, Trout, Mountain Gazelle	20	21	21	23	24	24	24	24	24
The Number of Wild Animals Rehabilitated and Released back to Nature	921	1,643	2,109	2,561	2,465	4,881	5,733	5,889	

Source: "Status Reports on Nature Conservation 2020", Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks,2021,

9.6- Regulation and Supervision of Wild Animal Trade in Accordance with International Conventions

D P S I R

The indicator is a response indicator related to biodiversity conservation.

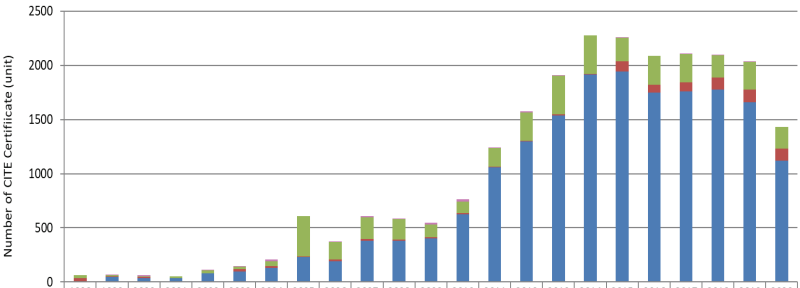
CITES Convention is the "Convention on International Trade in Endangered Species of Wild Fauna and Flora".

Turkey has been a party to CITES Convention since 1996 and By-Law on National Implementation of CITES was published in 2001.

The Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks, is authorized to issue CITES certificates and take the necessary measures for birds, reptiles, mammals (except marine mammals), reptiles, arthropods, and other species that are not included in the tasks of Management Authorities listed in subparagraphs (a), (b), and (c). The Ministry also performs tasks such as coordination, reporting, and training. Turkey is placed in Category A based on its successful efforts.

A CITES permit is issued for international trade in the species listed in the CITES Supplementary lists. In 2018, a total of 2,098 documents were issued. In 2020, a total of 1,430 documents were issued. Certificates of conformity for import and export are issued for species not included in the supplementary lists of CITES. In 2020, a total of 827 documents were issued[68].

GRAPH 103- NUMBER OF CITES DOCUMENTS BY DOCUMENT TYPE (1998-2020)



	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Other		6	11	0	3	5	14		9	8	9	17	22	2	8	2	0	4	0	2	2	2	
Re-export	29	11	7	16	24	22	47	375	159	202	190	116	110	173	263	353	353	217	269	260	210	256	197
Export	27	5	9	4	4	18	15	7	16	19	12	11	9	9	6	10	8	98	71	83	108	113	111
Import	5	44	36	32	76	98	130	228	192	378	377	403	624	1057	1298	1539	1914	1943	1750	1762	1778	1661	1122

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

9.7- Distribution of Forest Areas

D P **S** I R

The indicator is a state indicator and represents the total size of forest areas. The total forest area of Turkey in 2020 was 22,933,000 ha. This forest area represents 29,4 % of the total area of the country. However, 58% of this area is normal closed areas, 42% is degraded closed areas (sparsely vegetated or unvegetated) [69].

As of 2020, the tree cover of Turkish forests is 1,697,055 thousand m3. Of these, 95.9% are normal closed forest areas and 4.1% are closed forest areas with gaps. Between 1973 and 2020, the tree cover of the country's forests increased by 761,543 thousand m^3 [70].

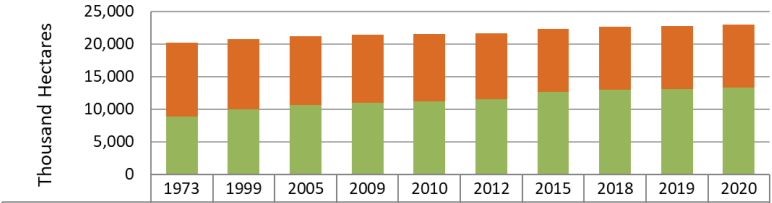
While the forest area in Turkey accounted for 26.7% of the country's surface area in 1999, this percentage increased to 29% in 2020.

TABLE 25- FOREST AREA BY YEARS

YEARS	1973	1999	2005	2010	2012	2015	2018	2019	2020
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

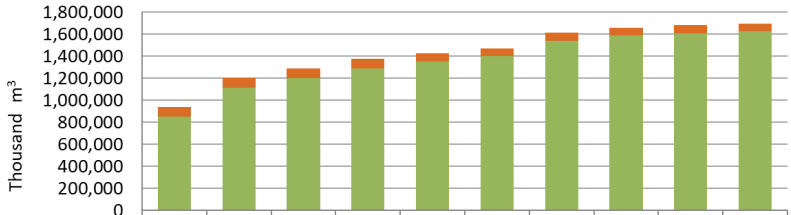
Source: Ministry of Agriculture and Forestry, General Directorate of Forestry, https://www.ogm.gov.tr/ekutuphane/Sayfalar/Istatis- tikler.aspx

GRAPH 104- DISTRIBUTION OF THE FOREST LAND BY FOREST FORM



	1973	1999	2005	2009	2010	2012	2015	2018	2019	2020
Degraded Closed	11,343	10,736	10,568	10,417	10,334	10,119	9,639	9,639	9,656	9,669
Normal	8,856	10,028	10,621	10,973	11,203	11,559	12,704	12,983	13,083	13,264

GRAPH 105- DISTRIBUTION OF FOREST WEALTH BY FOREST FORM

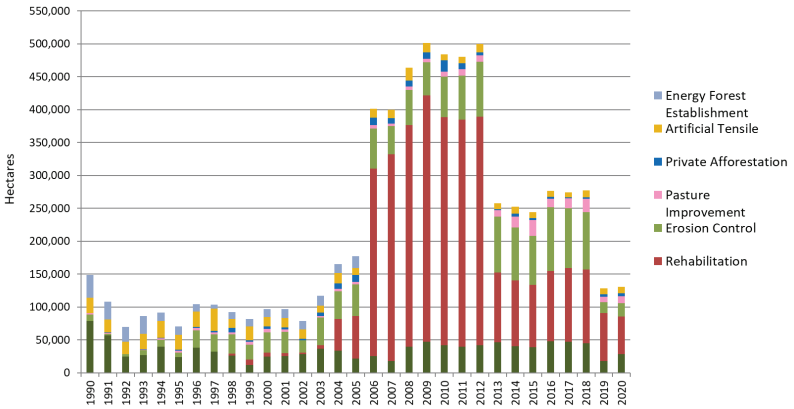


	1973	1999	2005	2009	2010	2012	2015	2018	2019	2020
Degraded Closed	88,479	87,179	89,091	83,791	81,051	71,088	71,951	69,873	69,514	68,759
Normal	847,033	1,113,6	1,199,0	1,290,4	1,347,4	1,400,0	1,539,8	1,588,2	1,609,8	1,628,2

Source: Ministry of Agriculture and Forestry, General Directorate of Forestry, http://www.ogm.gov.tr/ekutuphane/Sayfalar/Istatistikler.aspx

42% of forests in Turkey are degraded closed forest areas, and they are inefficient. It is important to rehabilitate inefficient forest areas and convert them into productive areas. More rehabilitation studies were conducted especially between 2006 and 2012. In 2020, forest rehabilitation activities were carried out on a total of 131,062 ha, including afforestation on 28,632 ha area, rehabilitation on 56,576 ha area, erosion control on 20,902 ha, pasture improvement on 10,438 ha area, private afforestation on 4,374 ha area and artificial tensile work on 10,140 ha area[71].

GRAPH 106- FOREST ESTABLISHMENT ACTIVITIES (ha) (1990-2020)



Source: Ministry of Agriculture and Forestry, General Directorate of Forestry, "Forest Statistics 2020", https://www.ogm.gov.tr/ekutuphane/Pages/Statistics.aspx, 2021

9.8- Distribution of Forest Areas According to Tree Species

D P S I R

The diversity of tree species is a positive indicator of the state of biodiversity. In 2020, the total forest area of Turkey was composed of 29.4% oaks, 22.7% Turkish pines and 18,3% black pines[72].

TABLE 26- DISTRIBUTION OF FOREST AREAS ACCORDING TO MAIN TREE SPECIES

Tree species groups	Forrest Form (ha)			% Share
	Normal	Degraded Closed	Total	
Turkish Pine (pinus brutia)	2,666,577	4,080863	6,747,440	29.4
Oak (Quercus sp)	3,407,368	1,807,294	5,215,292	22.7
Black Pine	2,830,566	1,369,057	4,199,623	18.3
Beech (fagus orientalis)	1,611,346	266,613	1,878,049	8.2
Scots pine (pinus sylvestris)	890,232	519,939	1,410,177	6.1
Juniper (Juniperus)	402,522	1,070,466	1,472,988	6.4
Fir	393,504	118,199	511,703	2.2
Cedar	268,140	134,179	402,319	1.8
Spruce Tree	273,032	92,813	365,845	1.6
Stone Pine	152,066	23,312	175,378	0.8
Alder	100,434	25,097	125,531	0.5
Chestnut	67,382	13,850	81,332	0.4
Hornbeam	45,068	10,585	55,654	0.2
Maritime Pine (pinus pinaster)	50,188	5,316	55,498	0.2
Poplar	9,042	13,783	22,525	0.1
Hazel Tree	12,236	700	12,936	0.1
Bay Tree (Laurel)	5,660	6,524	12,184	0.1
Ash Tree	9,344	1,054	10,398	0.0
Other Species *	69,631	108,597	178,228	0.8
TOTAL	13,264,429	9,668,571	22,933,000	

(*) The title "Other species" includes cypress, Aleppo pine, maritime pine, radiata pine, black locust, sycamore, walnut, Turkish/oriental sweetgum and numerous other tree species not listed here

Source: Ministry of Agriculture and Forestry, General Directorate of Forestry, https://www.ogm.gov.tr/ekutuphane/Sayfalar/Istatistikler.aspx,2021

9.9- Distribution of Forests According to Their Main Functions

Today, forests are planned using an ecosystem, functional planning approach based on multidirectional use. According to these planning data, 42.3% of forests have economic functions, 48.5% have ecological functions, and 9.2% have socio-cultural functions[73].

TABLE 27- DISTRIBUTION OF FORESTS ACCORDING TO THEIR MAIN FUNCTIONS

MAIN FUNCTIONS	GENERAL FOREST LANS (hectare)			% Share
	Normal Closed	Degraded Closed	TOTAL	
1– Economic Function	7,178,776	2,517,380	9,696,156	42.3
2– Ecologic Function	4,856,960	6,263,785	11,120,745	48.5
3– Sociocultural Functions	1,228,6936	887,406	2,116,099	9.2
TOTAL	13,264,429	9,668,571	22,933,000	100

Source: Ministry of Agriculture and Forestry, General Directorate of Forestry, "Forest Statistics 2020".

10

INFRASTRUCTURE AND TRANSPORT

10.1- Highway - Railway Network Intensity

D P S I R

The density of the road network provides information on the fragmentation of wildlife habitats and natural landscapes by active transport. Environmental risks such as traffic-related pollution and noise are also important factors. In this respect, the indicator is a pressure indicator.

In 2020, the number of active airports open to civil air traffic was 56 and the total length of airline routes in our country was 74,640 km. Turkey has a total of 403 coastal facilities and the number of internationally operating ports is 182. At the end of 2020, the length of the highway network (state roads and highways) was 68,663 km and the length of the railway network (conventional and high-speed lines) was 12,830 km in 2019[74].

TABLE 28- HIGHWAY AND RAILWAY NETWORKS BY YEARS (km)

YILLAR	2002	2005	2010	2015	2016	2017	2018	2019	2020
Highway Network Length (km))	63,082	63,606	64,865	66,437	67,161	67,620	68,034	68,231	68,633
Railway Network Length (km)	10,948	10,973	11,940	12,532	12,532	12,608	12,740	12,803	-

Source:

1) Length of National and Provincial Highways by years(km) General Directorate of Highways, 2021

2) "Highways Completed Over the Years," General Directorate of Highways, 2021

3) T.C. General Directorate of State Railways, 2019 2015-2019 Statistical Yearbook

Compared to highways, rail transport emits fewer greenhouse gases into the atmosphere thanks to more efficient energy consumption. It also plays an important role in the conservation of the natural environment, as less land is needed for railway construction. On the other hand, rail transport also helps reduce respiratory and other diseases caused by air pollution.

In Turkey, the length of highways per 100,000 inhabitants is 82 km and the length of the main railway line is 12 km. In the EU-28 countries, these figures average 400 km and 41 km, respectively. In terms of area, the length of highways per 1000 km^2 in Turkey is 88 km and the length of the railway main line is 13 km. In the EU-28 countries, these figures are 461 km and 48 km, respectively. It is expected that Turkey's road network will reach 70,000 km in length by 2023, and the rail network will reach 17,527 km[75],[76],[77].

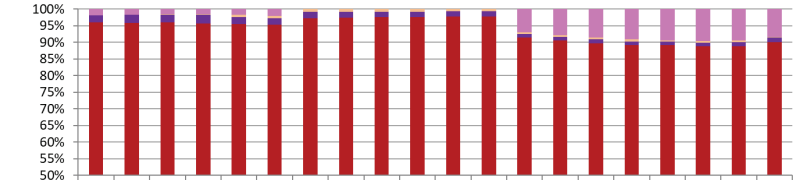
10.2- Passengers and Freight Transported by Mode of Transport

D P S I R

This indicator is a driving force indicator and plays a role in transport-related environmental impacts. In domestic passenger transport, the share of air transport increased from 1.8% in 2000 to 8.3% in 2019; in the same period, the share of road transport decreased from 95.9% to 90.1% and that of rail transport from 2.2% to 1.3%. The share of maritime passenger transport was 0.30% in 2019. The target is to reduce the share of domestic passenger transport by road (in passenger/km) to 76% by the end of 2023[78].

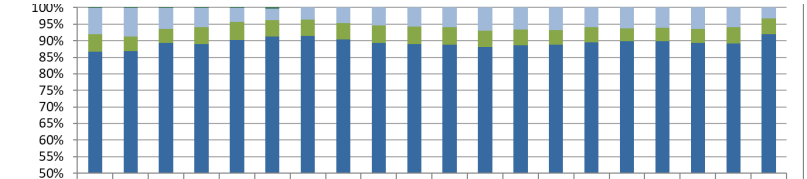
Looking at domestic freight transportation in 2019, it can be seen that highways once again dominate with 91.9%. In 2019, it can be observed that the shares of railways and maritime transport in domestic freight transport have decreased compared to 2000.

GRAPH 107- DOMESTIC PASSENGER TRANSPORT RATIOS (% rate on passenger-km) *



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Airline	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%
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%	0.30%
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%
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%	90.1%

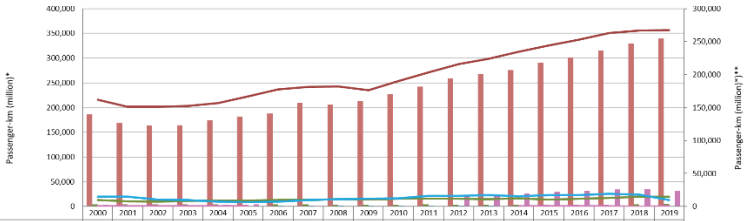
GRAPH 108- DOMESTIC FREIGHT TRANSPORT RATIOS (% rate over Tonnes-km) **



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Airline	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%													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%	3.3%
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%	4.8%
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%	89.2%	91.9%

Sources: Ministry of Transport and Infrastructure, General Directorate of the Turkish State Railways
Notes: 1) Urban transport was not included in passenger transport.
2) Data on freight and passenger transport on the road network under the responsibility of the of Directorate General for State Highways were considered.
3) Marmaray and suburban transport are not included in rail passenger data. Only TCDD A.Ş. Outline data are retrieved.
4) Data on domestic freight and domestic passenger transportation between our airports belonging to the General Directorate of the State Airports Authority were considered. There is no data for the cells left blank.
5) It is the passenger-km value of passengers carried in cabotage and the tonne-km value of cargoes.
*Passenger/Km: Unit of measure of traffic resulting from the transportation of one passenger over one kilometer.
**Ton/Km: Unit of measure of traffic resulting from the transport of one ton of goods over a distance of one kilometer.

GRAPH 109- DOMESTIC PASSENGER AND FREIGHT TRANSPORT ACCORDING TO TRANSPORT PATHS

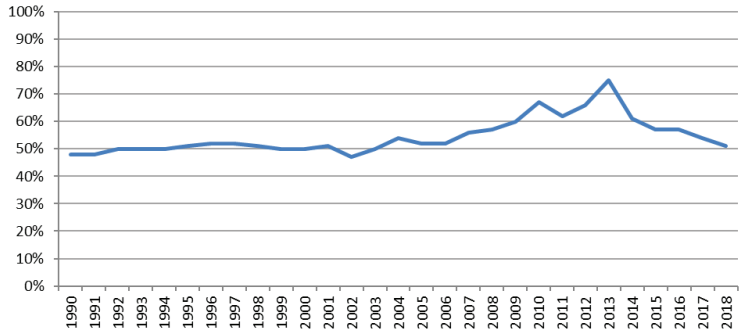


	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Road passenger-km (million)	185,68	168,21	163,32	164,31	174,31	182,15	187,59	200,11	206,09	212,46	226,91	242,26	258,87	268,17	276,07	290,73	300,85	314,73	329,36	339,60
Railway passenger-km (million)	4,240	4,213	3,939	4,583	3,835	3,661	3,878	4,080	3,650	3,577	3,606	4,002	3,006	3,020	3,458	3,708	3,323	3,683	4,374	4,917
Maritime passenger-km (million)	56	57	39	41	1,150	1,240	1,395	1,561	1,570	1,643	1,570	1,570	1,459	1,667	1,806	1,836	1,312	2,109	2,101	1,219
Airline passengers-km (million)	3,555	2,859	2,706	2,752	3,223	3,992	0	0	0	0	0	0	19,731	23,357	26,204	29,790	31,730	34,018	34,996	31,174
Road ton-km (million)	161,55	151,42	150,91	152,16	156,85	166,83	177,39	181,33	181,93	176,45	190,36	203,07	216,12	224,04	234,49	244,32	253,13	262,73	266,50	267,57
Railway ton-km (million)	9,891	7,558	7,221	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
Maritime ton-km (million)	14,631	15,001	10,677	10,001	7,777	6,439	7,084	9,573	11,114	11,397	12,570	15,959	16,223	17,312	15,577	17,704	17,779	18,946	17,801	9,510
Airline ton-km (million)	310	285	275	276	321	392									28	25	19	18	13	15

Sources: Ministry of Transport and Infrastructure, General Directorate of the Turkish State Railways
Notes: 1) Urban transport was not included in passenger transport.
2) Data on freight and passenger transport on the road network under the responsibility of the of Directorate General for State Highways were considered.
3) Data on freight and passenger transport belonging to the General Directorate of the Turkish State Railways were considered. Data on suburban passenger transport were not considered.
4) Data on domestic freight and domestic passenger transportation between our airports belonging to the General Directorate of the State Airports Authority were considered. There is no data for the cells left blank.
5) Data on freight and passenger transports was taken into account on the cabotage line of the General Directorate of the Maritime Trade were taken into account. The value given as Ton-Miles was converted to Ton-Km, the value given as Passenger-Miles was converted to Passenger-Km.
*Passenger/Km: Unit of measure of traffic resulting from the transportation of one passenger over one kilometer.
**Ton/Km: Unit of measure of traffic resulting from the transport of one ton of goods over a distance of one kilometer.

From the point of view of environmental compatibility, rail should be preferred to road transport. In addition to the expansion of the rail network, effective utilization is also an important concern. Although the utilization rate of rail freight increased to 75% in 2013, it decreased to 51% in 2018.

GRAPH 110-CAPACITY UTILISATION OF FREIGHT TRANSPORT BY RAIL (%)



Source: For 1990-2016, data of Ministry of Transport and Infrastructure: 2017-2018 data of General Directorate of the Turkish State Railways Administration; Turkish State Railways Transportation Co.

NOTE: Since 2017, data on freight transport are only transport data in the area of the General Directorate of TCDD Transportation Co. Data from other railway train operations hasn't been included.

10.3- Greenhouse Gas Emissions by Mode of Transport

D P S I R

This indicator is a pressure indicator. The contribution of transport to climate change and the distribution of this contribution by mode are important for monitoring and controlling emissions.

According to TURKSTAT's greenhouse gas emission inventory data, in 2019, Turkey's total greenhouse gas emissions in 2019 amount to 506.1 million tons of CO_2 equivalent. In 2017, transportation-related emissions accounted for 84,659 kilotons of CO_2 equivalent of total greenhouse gas emissions, while this amount accounts for 80,745 kilotons of CO_2 equivalent of total emissions in 2019. While transport-related emissions accounted for 12.8% of total greenhouse gas emissions in 1990, this figure increased to 16% in 2019.

According to TURKSTAT's greenhouse gas emission inventory data for 2019, 93% of CO^2 emissions from transport came from road transport, 4.3% from air transport, 1.5% from maritime transport, 0.4% from rail transport, and 0.7% from other modes of transport.

Looking at the situation in the EU-28 countries, 23,2% of the total greenhouse gas emissions in the EU-28 in 2019 came from transport (emissions from international aviation and emissions from the sea were not included)[79].

GRAPH 111- GREENHOUSE GAS EMISSIONS BY MODE OF TRANSPORT

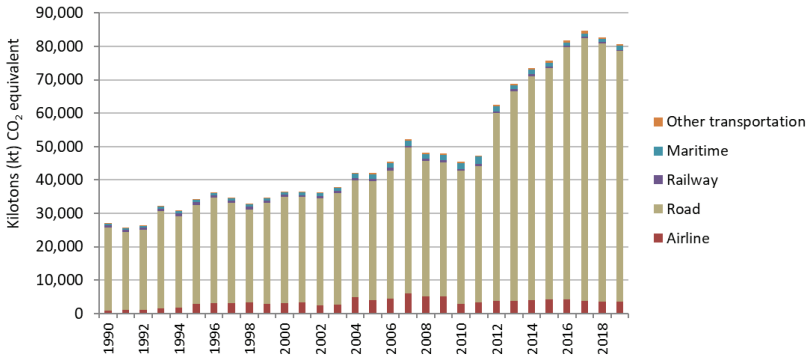


TABLE 29- GREENHOUSE GAS EMISSIONS BY MODE OF TRANSPOR (kilotons CO_2 equivalent)

Years	1990	1995	2000	2005	2010	2015	2018	2019
Total	26,969	34,113	36,465	42,041	45,392	75,789	82,787	80,745
Airline	923	2,775	3,099	4,089	2,862	4,205	3,648	3,472
Road	24,777	29,760	31,850	35,532	39,941	69,309	77,289	75,130
Railway	721	768	713	757	517	480	388	357
Maritime	509	726	623	1,299	1,682	1,147	920	1,204
Other Transportation	39	83	180	364	390	647	541	580

Source: TURKSTAT, 2021

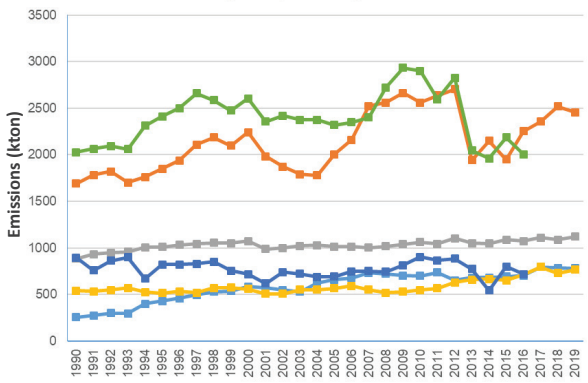
10.4- Emissions of Air Pollutants from Transport

D P S I R

Air pollutant emissions from transport are important pressure indicators that representthe impact of transport activities on air pollution.

A major sector included in the National Air Pollutants Emission Inventory is transportation. Transport emissions are calculated separately for road, maritime, airline and rail transport, with the most relevant data for road transport as an indicator. The total values of road transport-related emissions calculated at the national level are included in the graph. Looking at the emission status from 1994 to 2019 shows that the reduction of vehicle emissions is progressing with renewed engine technologies[80].

GRAPH 112- TOTAL NO_x and PM_{10} EMISSIONS FROM ROAD TRANSPORTATION



Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of Environmental Management, 2021

10.5- Final Energy Consumption by Mode of Transport

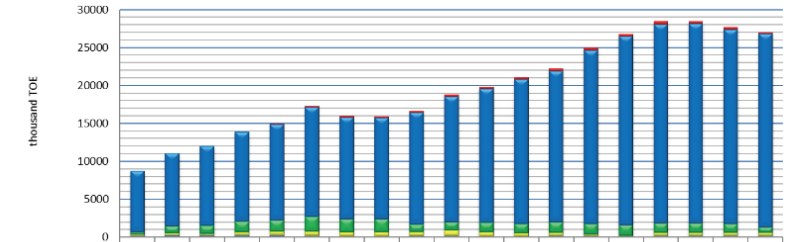
D P S I R

Energy consumption is a major driver of environmental pressure factors, especially climate change. Reducing the number of trips and time spent in traffic, using more fuel-efficient modes of transportation, increasing the energy efficiency of vehicles, and using technologies that use renewable or low-carbon fuels are methods to reduce transportation fuel consumption.

In 2020, the total energy consumption of the transport sector increased by 209.32% compared to 1990, reaching 26,979 thousand TOE (tonnes of oil equivalent). Excluding the 171 thousand TOE consumed in pipeline transport, 95% of the 26,808 thousand TOE was consumed in road transport, 2.7% in air transport, 1.5% in maritime transport and 0.7% in rail transport[81].

In 2020, air transport energy consumption increased by 218% compared to 1990, followed by road transport with an increase of 161% and maritime transport with an increase of 132% compared to 1990. Rail transport energy consumption decreased by 15% compared to 1990.

GRAPH 113- 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
Pipelines					113	156	170	182	200	247	239	235	311	300	284	392	293	273	171
Road Transport	8015	9651	10508	11785	12604	14368	13402	13306	14740	16494	17583	18987	19928	22833	24866	26164	26286	25605	25472
Airlines	311	924	1034	1368	1509	2014	1748	1721	956	1127	1258	1253	1367	1405	1430	1272	1247	1174	722
Maritime Transport	158	226	195	411	464	507	491	525	541	718	528	370	432	189	48	393	398	396	412
Railways	238	276	270	285	289	217	164	162	169	173	160	162	180	209	128	204	216	206	201

Source: Ministry of Energy and Natural Resources, http://www.eigm.gov.tr/tr-TR/Denge-Tablolari/Denge-Tablolari

Of the 26,808 thousand TOE of energy consumed in the transportation sector in Turkey in 2020, excluding pipelines, 98.9% were petroleum products, 0.2% natural gas, 0.46% bioenergy and waste, and 0.40% electricity.

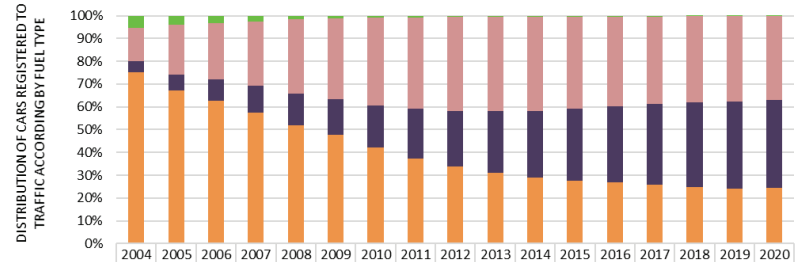
10.6- Share of Alternative Fuel Vehicles

D P S I R

Looking at the distribution of vehicles registered in traffic by fuel type, there were 13,099,041 vehicles registered in traffic at the end of 2020. Of these, 38.3% were powered by diesel, 36.7% by LPG, and 24.4% by petroleum. The share of cars with an unknown fuel type is 0.3%[82].

In 2019, the majority of cars in EU countries had a gasoline-fuelled engine. The share of diesel vehicles is particularly high in Lithuania (67.8%) and France (63.2%), followed by Luxembourg (61.5 %)[83].

GRAPH 114- DISTRIBUTION OF CARS REGISTERED TO TRAFFIC ACCORDING BY FUEL TYPE (%) (2004-2020)



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
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	0.4	0.3	0.3	0.3
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
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
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

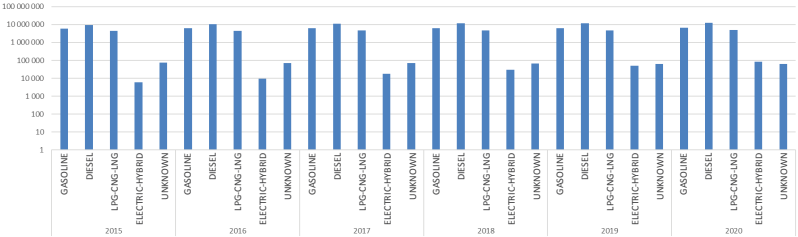
Source: TURKSTAT, (1) Unknown fuel type includes vehicles whose fuel type was not reported at registration or inadvertently entered incorrect data.

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

Looking at the data from TURKSTAT, it can be seen that between 2004 and 2007, fueled vehicles were used (gasoline, diesel, and LPG), while since 2015, the use of electric, gasoline-electric, and dieselelectric vehicles has become more prevalent.

The distribution of fuels used according to the types of vehicles registered to traffic (cars, minibusses, busses, vans, trucks, motorcycles, tractors and special purpose vehicles) is shown in the graph. While the number of electric hybrid vehicles (electric, gasoline-electric, diesel-electric) was 5,847 in 2015, it reached 82,710 in 2020.

GRAPH 115- FUEL DISTRIBUTION OF TRAFFIC REGISTERED VEHICLES



10.7- Number of Motor Vehicles

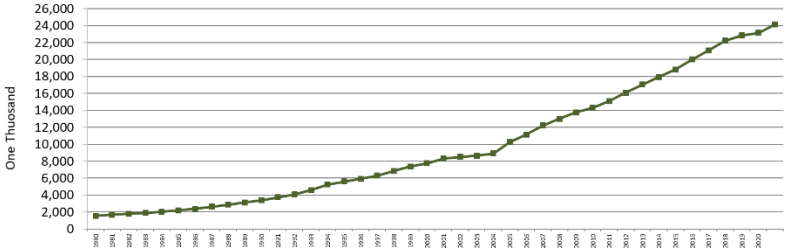
D P S I R

Emissions from motor vehicles are a major cause of air pollution, especially in large cities. The number of vehicles is a pressure indicator.

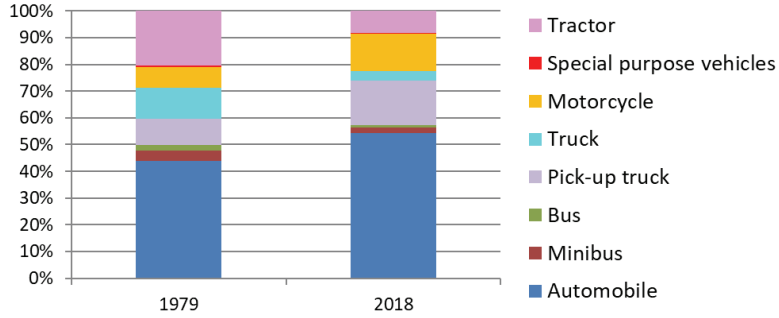
The total number of motor vehicles, which was 1,566,405 in 1979, increased and reached 24,144,857 in 2020. When comparing the share of motor vehicle types on the roads between 1979 and 2020, the increase in the shares of cars, vans, and motorcycles in 2020 is striking. In 2020, automobiles account for 54.3% of the total number of motor vehicles, 16.3% pick-up trucks, 14,5% motorcycles, 8.1% tractors, 3.6% trucks, 2% minibuses, 0.9% buses, and 0.3% special purpose vehicles[84].

Despite the increasing number of vehicles, the vehicle ownership rate in Turkey is far below the European average due to high prices and taxes. According to the 2019 data, the number of cars per thousand inhabitants was 681 in Luxembourg and 663 in Italy, while this figure was 150 in Turkey[85]. The EU-27 average was reported at 553 for 2019[86].

GRAPH 116- NUMBER OF MOTOR VEHICLES BY YEARS (1979-2020)



GRAPH 117- DISTRIBUTION OF MOTOR VEHICLE TYPES OF 1979 and 2020 (%)



Source: TURKSTAT,2001. Note: Vehicles published under construction machinery and heavy tonnage vehicles included in special purpose vehicles have been reported under the heading "truck" since 2004.

10.8- Average Age of Vehicles Registered to the Traffic

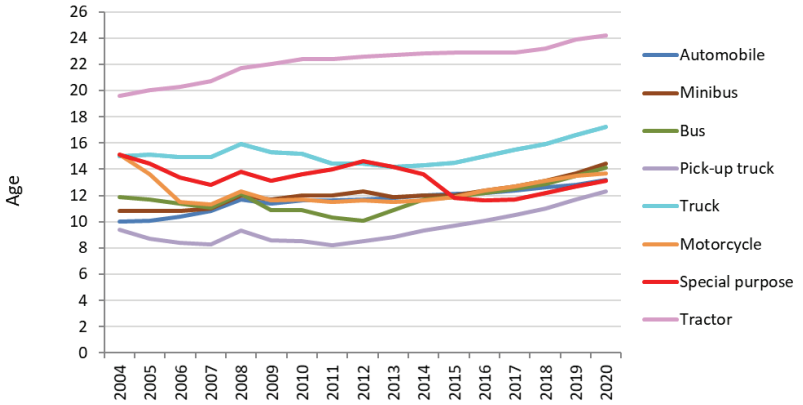
D P S I R

The indicator is a driving force indicator. The average age of the vehicle fleet is an indirect indicator of the environmental friendliness of road transport. It is expected that the value of this indicator and its impact on the environment will be reduced by replacing old and polluting vehicles with newer and cleaner vehicles.

However, despite this expectation, it was found that the average age of total vehicles registered for traffic was 12 years in 2004 and 14.2 years in 2020. While the average age of passenger cars was 10 years in 2004, it increased by 32% to 13.2 years in 2018. The average age of other vehicle types in 2020 was as follows: 14.4 years for minibuses, 14.1 years for buses, 12.3 years for pickup trucks, 17.2 years for trucks, 13.7 years for motorcycles, 13.1 years for special purpose vehicles, and 24.2 years for tractors[87].

In the EU-27 countries, the average age of passenger cars was 11.5 years in 2019, although it is lower than in Turkey. The average age of other types of vehicles in 2019 was 11.6 years for light commercial vehicles, 13 years for heavy vehicles, and 11.7 years for buses[88].

GRAPH 118- AVERAGE AGE OF VEHICLE TYPES REGISTERED IN TRAFFIC (2004-2020)

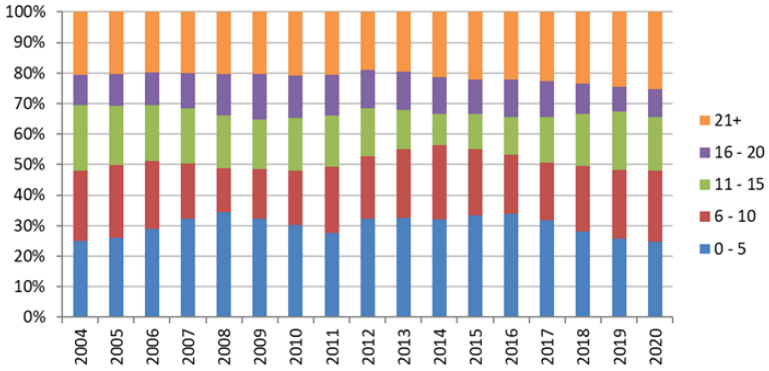


Source: TURKSTAT, 2021

The percentage of cars over 21 years old is high in Turkey and is 25.2% in 2020[89]. In 2019, the share of cars over 21 years old is 4.5% in Denmark and 6.3% in the Netherlands and Belgium[90].

Looking at the distribution of total vehicles registered in traffic by age group in Turkey in 2020, it can be seen that 24,8 % of vehicles fell into the 0-5 age group, 23,3% into the 6-10 age group, 17,5% into the 11-15 age group, 9.3% into the 16-20 age group, and 25.2% into the 21+ age group.

GRAPH 119- DISTRIBUTION OF TOTAL VEHICLES REGISTERED IN TRAFFIC BY AGE GROUP (%), 2004-2020



Source: TURKSTAT, 2021

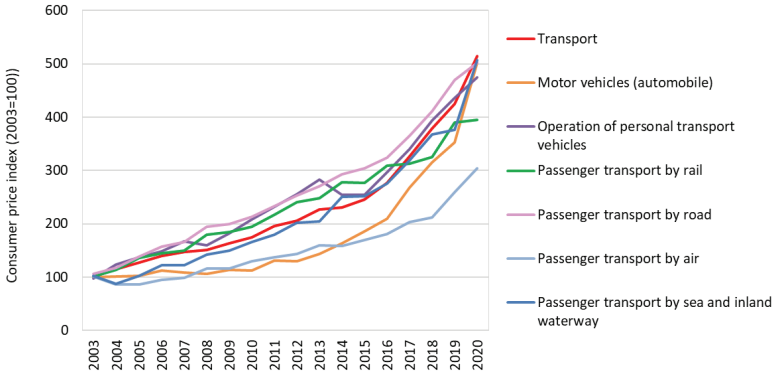
10.9- Real Change in Transport Prices by Mode

D P S I R

The indicator is a driving force indicator. The prices of transport services influence the growth of the transport sector and the choice of transport mode. It is important that prices be monitored to determine whether users are being given adequate incentives to use more environmentally friendly modes of transportation. However, there are variations over time that can affect the reliability of the comparison. For example, people no longer tend to buy the same cars and use the same package of transportation services (price/quality) as they did ten years ago[91].

According to the 2003 Indexed Consumer Price Index (CPI), by the end of 2020, the cost of passenger transportation by road increased by 374.2%, the cost of passenger transportation by rail increased by 290%, the cost of passenger transportation by sea and inland waterway increased by 397%, and the cost of passenger transportation by air increased by 201.4%[92].

GRAPH 120- REAL CHANGE IN TRANSPORT PRICES BY MODE



Source TURKSTAT, 2021

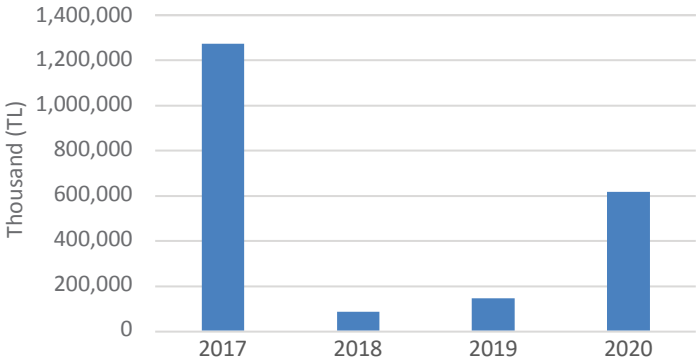
Notes: (1) 2003 = 100 Base Annual Consumer Price Index (CPI) index

10.10- Taxes / Expenditures and Subsidies in Railway Transport

D P S I R

The indicator is a driving force indicator and important for promoting the use of railways, which are more environmentally friendly than road transport. According to the data provided by the Ministry of Transport and Infrastructure, the development of payments under public service obligations in the railway sector by year is as follows.

GRAPH 121- PAYMENTS UNDER THE PUBLIC SERVICE OBLIGATION IN THE RAILWAY SECTOR (2017-2020)



Source: Ministry of Transport and Infrastructure, 2021

11

ENERGY

11.1- Total Energy Consumption by Sectors

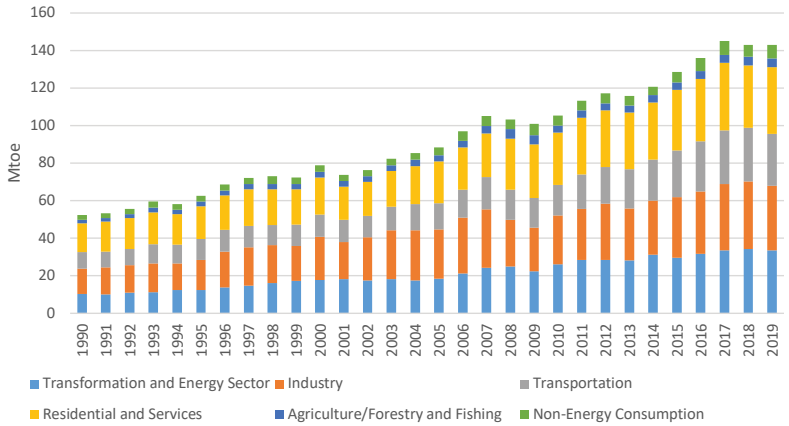
D P S I R

The indicator is a driving force indicator that identifies energy consumption. In Turkey the total energy consumption in 2019 was 144.205 Mtoe (million tons of oil equivalent). The total energy consumption of Turkey increased by 175% compared to 1990, 63% compared to 2005, 0.4% compared to 2018[93].

According to data of 2019, the total energy consumption in the EU-28 countries decreased by 1,7% compared to the previous year[94].

In Turkey, the breakdown of primary energy consumption in 2019 shows that the highest consumption takes place in the residential and services sector with 24.7% and industrial sector with 23,8%. These are followed by transformation and energy sector with 23.3%, transportation with 19.2%, non-energy consumption with 4.9% and agriculture/forestry and fishing sector with 3.3%[95].

GRAPH 122- TOTAL ENERGY CONSUMPTION BY SECTORS (Mtoe)



Source: Ministry of Energy and Natural Resources, https://enerji.gov.tr/enerji-isleri-genel-mudurlugu-denge-tablolari,2021

TABLE 30- TOTAL ENERGY CONSUMPTION BY SECTORS (Thousand TOE)

Years	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019
Energy Supply	52,465	62,968	79,428	88,672	105,888	129,139	136,229	145,305	143,666	144,21
Transformation and Energy Sector	10,228	12,442	17,834	18,347	26,048	29,672	31,655	33,522	34,517	33,56
Industry	13,641	15,986	22,876	26,410	26,077	32,157	33,254	35,329	36,277	34,30
Transportation	8,723	11,077	12,007	13,849	16,314	24,936	26,812	28,425	28,452	27,69
Residential and Services	15,356	17,514	19,557	22,285	27,762	32,329	33,222	36,013	33,074	35,61
Agriculture/ Forestry and Fishing	1,956	2,556	3,073	3,359	3,736	3,932	4,056	4,273	4,381	4,71
Non-Energy Consumption	2,543	3,087	3,455	4,089	5,314	5,652	6,989	7,372	6,296	7,08

Source: Ministry of Energy and Natural Resources, https://enerji.gov.tr/enerji-isleri-genel-mudurlugu-denge-tablo-lari,2021

11.2- Primary Energy Consumption by Fuel Type

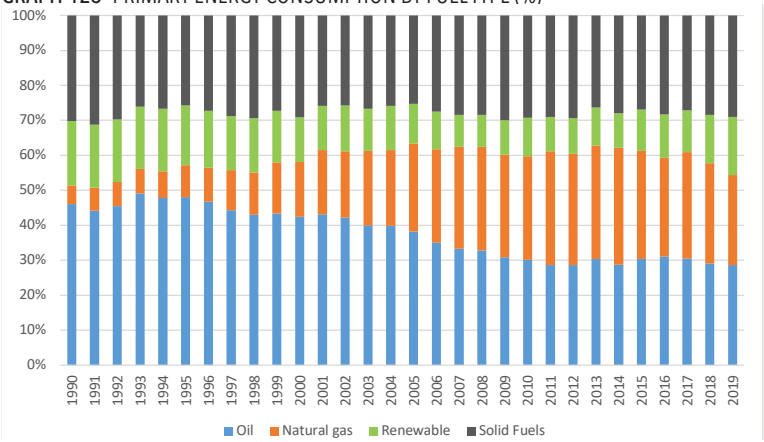
D P S I R

Total primary energy consumption according to type of fuel is an indicator of a driving force, which describes the improvement in energy resources and the level of consumption. Fossil fuel consumption (crude oil, petroleum products, mineral coal, lignite, natural and derivative gases) is a surrogate indicator of resource consumption, greenhouse gas emissions and air pollution (SO2 and NOX) levels. The level of the environmental impact depends on the relative portions of the fossil fuels used and the magnitude of the precautions taken to reduce pollution.

Primary energy consumption of Turkey increased from 52.465 Mtoe in 1990 to 144.205 Mtoe in 2019. As of 1990, the share of solid fuels in primary energy consumption of Turkey was 30.2%. While the share of oil was 46.1%, that of natural gas was 5.4% and that of renewable energy resources was 18.4%. As of 2019, 29.1 % of Turkey's primary energy consumption was met by solid fuels. While the share of oil decreased to 28.6%, that share of natural gas increased to 25.7%. The share of renewable energy resources was 16.6%.

As of 2019, 11.1% of the total primary energy consumption in the EU-28 countries was from solid fuels, 32.8% from oil, 25.4% from natural gas, 13.3% from nuclear, 15.9% from renewable energy resources and 1.5% from other resources[96].

GRAPH 123- PRIMARY ENERGY CONSUMPTION BY FUEL TYPE (%)



Source: Ministry of Energy and Natural Resources, https://enerji.gov.tr/enerji-isleri-genel-mudurlugu-denge-tablolari,2021

11.3- Final Energy Consumption by Sectors

D P S I R

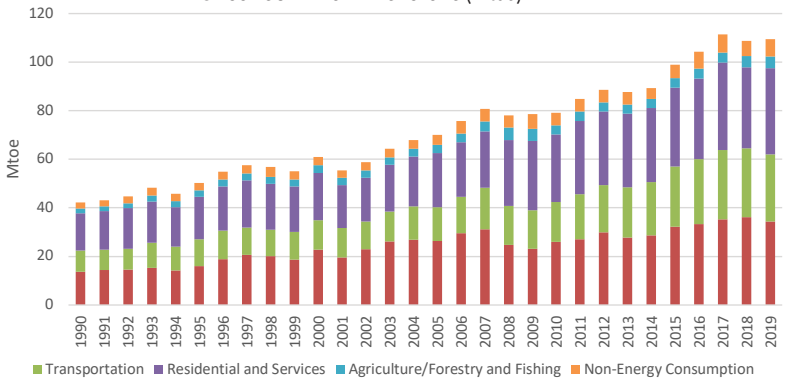
Final energy consumption by sector type is a driving force indicator. The trend in final energy consumption by fuel type and by sector provides a broad indication of progress in reducing final energy consumption and associated environmental impacts by the different end-use sectors (transportation, industry, services and households).

The total final energy consumption in Turkey was 110.649 Mtoe in 2019, with an increase of 162% compared to 1990, 56% compared to 2005 and with an increase of 0.6% compared to 2018. Large increases in final energy consumption could be attributes to the growing economy in Turkey. However, in order to mention an improvement, energy intensity must decrease with improvement in energy efficiency. For instance, in the EU-28, owing to improvements in energy efficiency, the final energy consumption decreased by 0.2% in the last 10 years according data of 2019[97].

In 2019 in Turkey, the highest share of final energy consumption occurred in Residential and services sector (32.6%) and industrial sector (%31.4), followed by transportation (25.3%) and agriculture/forestry and fishing sectors (4.3%). The share of non-energy consumption was 6.5%.

Compared to the EU countries, in 2019, the residential and services sector took the highest share in energy consumption with 37.2%; followed by transportation (28.6%), industry (22.5%) and agriculture/forestry and fishing (2.7%) in the EU-28-member states. The share of non-energy consumption was 8.5%[98].

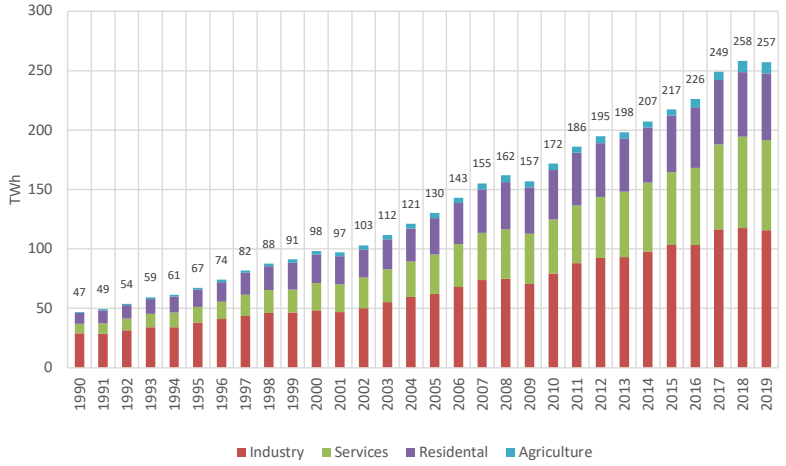
GRAFİK 124- FINAL ENERGY CONSUMPTION BY SECTORS (Mtoe)



Source: Ministry of Energy and Natural Resources, https://enerji.gov.tr/enerji-isleri-genel-mudurlugu-denge-tablolari,2021

In Turkey, the net electricity consumption of sectors was 257.3 TWh in 2019, with an increase of 449% compared to 1990, 98% compared to 2005 and decrease of 0.4% compared to 2018. In 2019 in Turkey, the highest share of electricity energy consumption occurred in industrial sector (45%) and services sector (%29), followed by residential (22%) and agriculture and other sectors (4%).

GRAFİK 125- NET ELECTRICITY ENERGY CONSUMPTION BY SECTORS (TWh)



Source: TEDAŞ Turkey Electricity Distribution and Consumption Statistics, Ministry of Energy and Natural Resources,2021

11.4- Energy Consumption per Capita

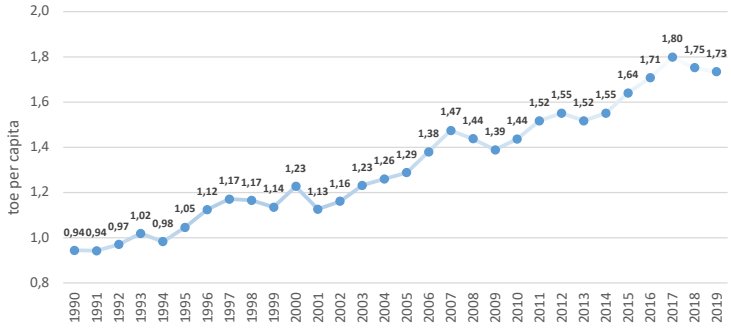
D P S I R

This driving force indicator shows energy consumption levels and is one of the indicators used for comparison among countries, regions, etc.

In Turkey, the energy consumption per capita was 0.94 toe in 1990 and 1.73 toe in 2019.

In European Union countries, per capita primary energy consumption was 3.51 toe in 1990 and 3.19 toe in 2019[99].

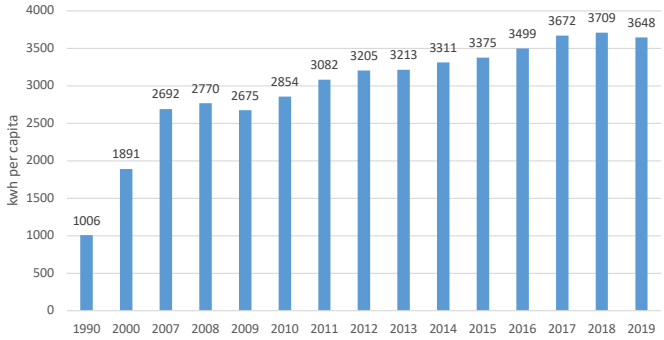
GRAPH 126- PRIMARY ENERGY CONSUMPTION PER CAPITA (toe per capita)



Source: Ministry of Energy and Natural Resources, 2021 https://enerji.gov.tr/enerji-isleri-genel-mudurlugu-den-ge-tablolari

In Turkey, electricity consumption per capita was 3,648 kWh in 2019 and around 1,000 kWh in 1990.

GRAPH 127- ELECTRICITY CONSUMPTION PER CAPITA (kWh per capita)



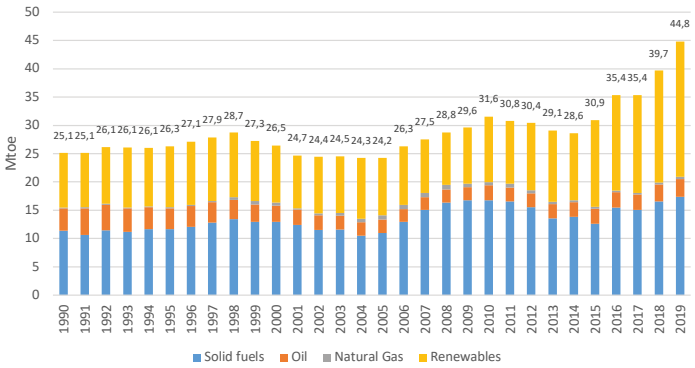
Source: Turkey Electricity Production-Transmission 2019 Statistics,https://www.teias.gov.tr/tr-TR/turkiye-elektrik-uretim-i- letim-istatistikleri, 2021

11.5- Primary Energy Production

D P S I R

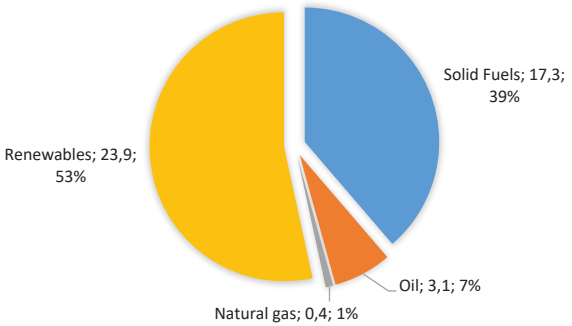
This indicator is a driving force indicator. While total primary energy produced in Turkey in 1990 was 25.138 Mtoe, this figure increased to 44.821 Mtoe in 2019. From 1990 to 2019, the increase in total primary energy production is 78%[100].

GRAPH 128- PRIMARY ENERGY PRODUCTION BY THE YEARS (Mtoe)



Source: Ministry of Energy and Natural Resources,2021, https://enerji.gov.tr/enerji-isleri-genel-mudurlugu-den-ge-tablolari

GRAPH 129-DISTRIBUTION OF PRIMARY ENERGY PRODUCTION BY RESOURCES (Mtoe and %) IN 2019



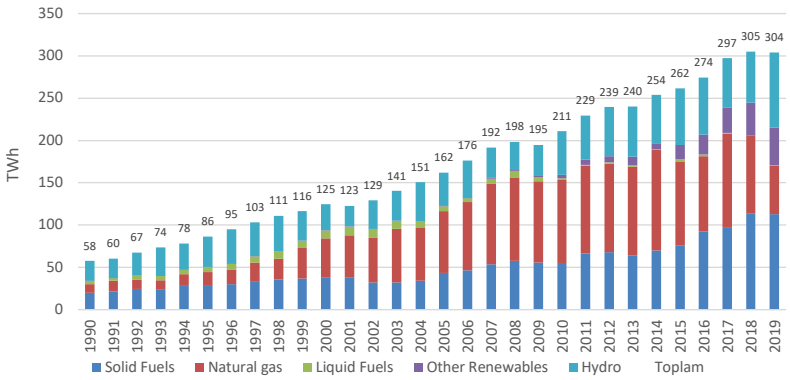
Source: Ministry of Energy and Natural Resources,2021, https://enerji.gov.tr/enerji-isleri-genel-mudurlugu-den-ge-tablolari

Electricity generation by resources;

In Turkey the total electricity generation was 303.9 TWh in 2019. The total electricity generation of Turkey increased by 428% compared to 1990, 88% compared to 2005 but decreased by 0.3% compared to 2018.

In Turkey, the breakdown of total electricity generation in 2019 shows that the share of solid fuels was 37%, natural gas 19%, hydro 29% and other renewable energy sources 15%. In 1990, it was 35% for solid fuels, 18% for natural gas, 7% for liquid fuels and 40% for hydro.

GRAPH 130- TOTAL ELECTRICITY GENERATION BY SECTORS (TWh)



Source: Turkey Electricity Production-Transmission 2019 Statistics, https://www.teias.gov.tr/tr-TR/turkiye-elektrik-u-retim-i- letim-istatistikleri,2021

11.6- Share of Renewable Energy Sources in Gross Final Energy Consumption

D P S I R

This response indicator displays the ratio of the energy produced by the renewable sources. Renewable energy sources are environment-friendly and have much lower CO_2 emission values per power unit generated.

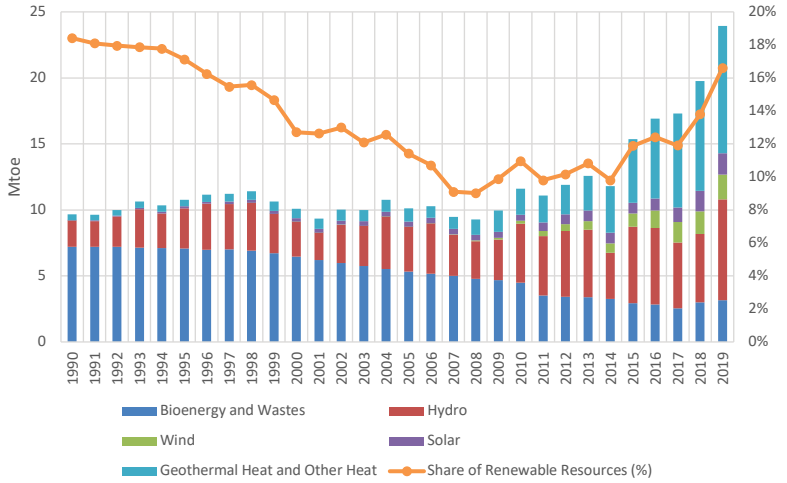
The most common renewable energy sources in Turkey are solar, wind, hydraulic, geothermal and biomass (wood, animal and plant residues) energy forms. While the

primary energy supply is 144.205 Mtoe, domestic gross energy production has reached to 44.821 Mtoe at the end of 2019. Renewable resources provide 53%, equal to 23.94 Mtoe, within the domestic gross energy production. The amount of energy from renewable resources increased by 148% compared to 1990.

In Turkey, while contribution of renewables to total energy consumption was 18.4% in 1990, in parallel with decreasing firewood consumption and increasing total energy consumption, this figure is 16.6% in 2019.

The share of renewable energy in EU-28 primary energy consumption increased from around 4.3% in 1990 to 15.4% in 2019[101].

GRAPH 131- 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/enerji-isleri-genel-mudurlugu-denge-tablolari

11.7- Share of Renewable Resources in Gross Electricity Consumption

D P S I R

This response indicator is the ratio of the amount of the electricity produced by renewable sources to the (total) gross electricity consumption (total electricity produced + electricity imported – electricity exported).

As of the end of 2019, Turkey's gross electricity consumption was 303,320.4 GWh. Electricity produced from renewable sources (133,379.2 GWh) was 44% of gross electricity consumption.

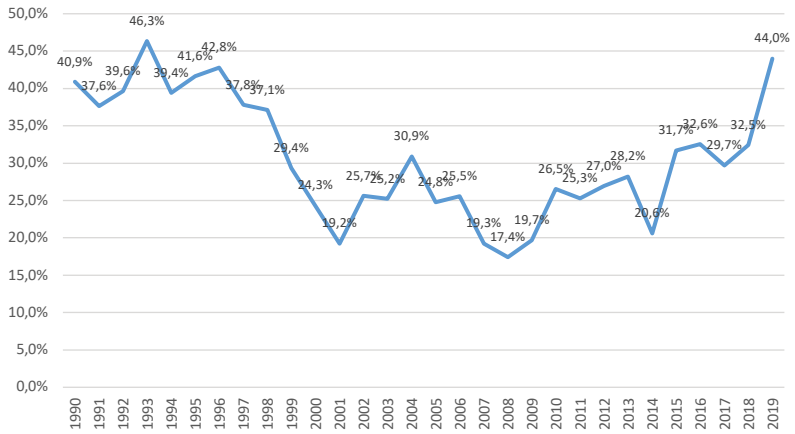
According to European Statistical Office (EUROSTAT), In 2019, the share of renewable electricity in gross electricity consumption was 34.2% in the EU-28[102].

TABLE 31- GROSS ELECTRICITY PRODUCTION FROM RENEWABLE ENERGY SOURCES IN 2019 (GWh)

Source	Generation (GWh)	Share (%)
Hydro	88,822.8	66.6
Wind	21,730.7	16.3
Geothermal	8,951.7	6.7
Bioenergy and Wastes	4,624.2	6.9
Solar	9,249.8	3.5
Total	133,379.2	100

Source: Turkey Electricity Production-Transmission 2019 Statistics, https://www.teias.gov.tr/tr-TR/turkiye-elektrik-uretim-i- letim-istatistikleri

GRAPH 132- SHARE OF RENEWABLE ELECTRICITY IN GROSS ELECTRICITY CONSUMPTION (%)



Source: Turkey Electricity Production-Transmission 2019 Statistics, https://www.teias.gov.tr/tr-TR/turkiye-elektrik-uretim-i- letim-istatistikleri

11.8- Primary Energy and Final Energy Intensity

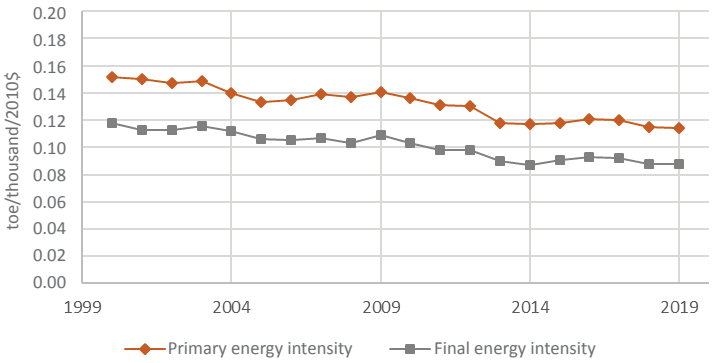
D P S I R/D P S I R

Primary energy intensity is the response, and final energy intensity is the driving force indicator. A reduction in indicator values means an improvement in energy efficiency. Primary energy intensity is an energy efficiency indicator that measures how much energy is needed to produce one unit of Gross National Product (GNP) at the regional and national levels. If the amount of energy required refers to the total energy provided in the country that has not been transformed, it is called primary energy intensity, while if the amount of energy required refers to the energy final consumption in sectors such as industry, housing, and transport, it is called final energy intensity. The trend in energy intensity is influenced by factors such as structural change in the economy and industry, changes in the energy consumption structure, productivity development of sectors, and the devices and equipment preferred by end users.

Turkey's primary energy intensity in 2019 decreased by 24.7% compared to 2000 and was calculated at 0.114 toe/thousand 2010$. This value is 0.115 toe/thousand 2010$ for 2018, well below the world average of 0.172 toe/thousand 2010$, but above the OECD average (0.102 toe/thousand 2010$). The average primary energy intensity of the European Union countries is 0.083 toe/thousand 2010$, better than the OECD and Turkey.

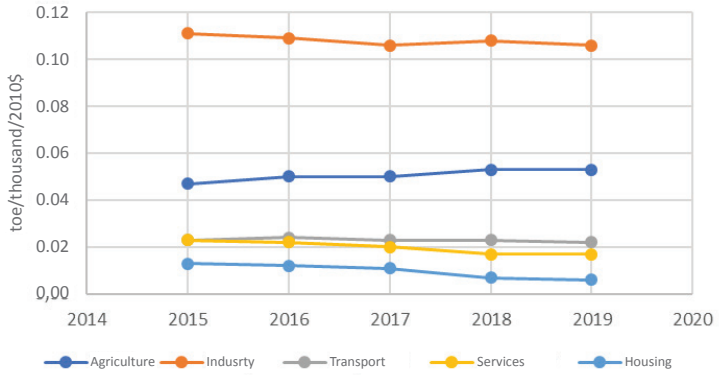
The final energy intensity was realized in 2019 at the level of 0.088 toe/thousand 2010$. In relation to this value, an improvement was achieved with a decrease of 25.5% compared to 2000.

GRAPH 133- PRIMARY AND FINAL ENERGY INTENSITY BY YEARS (Climate Corrected)



Source: Ministry of Energy and Natural Resources, Department of Energy Efficiency and Environment,2021

GRAPH 134- SECTORAL FINAL ENERGY INTENSITIES BY YEARS



Source: Ministry of Energy and Natural Resources, Department of Energy Efficiency and Environment,2021

Looking at the energy intensity of the main sectors, the industrial sector stands out as the most energy-intensive sector, as expected. It is followed by the agriculture, transport, services, and housing sectors, respectively. Over the 2015–2019 period, although there is a significant decrease in the industry, services, and housing sectors, the transport sector is relatively stagnant, while an increasing trend is observed in the agriculture sector[103].

The National Energy Efficiency Action Plan, prepared under the coordination of the Ministry of Energy and Natural Resources and covering the period 2017-2023, entered into force in 2017 and has been implemented since then. It is calculated that a total of USD 4.8 billion was invested in energy efficiency during 2017-2020, resulting in cumulative energy savings of 3.19 Mtoe, equivalent to USD 1.1 billion in monetary value. Under the NEE Action Plan, the cumulative realization rate of the 2017-2020 targets is 97%.

11.9- Energy Efficiency in Buildings

D P S I R

With regard to energy efficiency in the building sector, the "By-Law on Energy Efficiency in Buildings" dated 05.12.2008 numbered 27075 came into force, and together with the said by-law, the issuance of an energy certificate, which determines the energy consumption class of the building, became mandatory. By the end of 2021, energy identity certificates were issued for a total of 1,297,275 buildings, of which 333,691 were

existing buildings and 963,584 were new buildings. By the end of 2022, it is planned to issue 1,450,000 energy identity certificates. Renewable energy systems are used in 60,437 of these buildings with energy identity certificates. By the end of 2022, renewable energy systems are planned to be used in 70,000 buildings.

Under the "By-Law on the Allocation of Heating and Hot Water Costs in Central Heating and Hot Water Systems" number 26847, which came into force on 14.04.2008, it was mandatory for all existing and new buildings with central heating systems to comply with the cost allocation practice for central heating systems. Under these applications, the number of meter operators authorized to issue metering and cost allocation certificates for buildings with central heating systems was 155 at the end of 2021.

By- Law on Green Certificates for Buildings and Settlements No. 30279 entered into force on 23.12.2017. The By-Law aims to regulate the procedures and principles for the establishment of assessment and certification systems, as well as the determination of the tasks, qualifications and responsibilities of the persons involved in the assessment and certification process, in order to reduce the negative impact of buildings and settlements on the environment through the efficient use of natural resources and energy. For this reason, the Ministry has developed a National Green Building System software program (YeS- TR) to carry out the certification activities, and it is planned that 10 buildings will obtain the National Green Building Certificate by the end of 2022[104].

12

INDUSTRY AND MINING

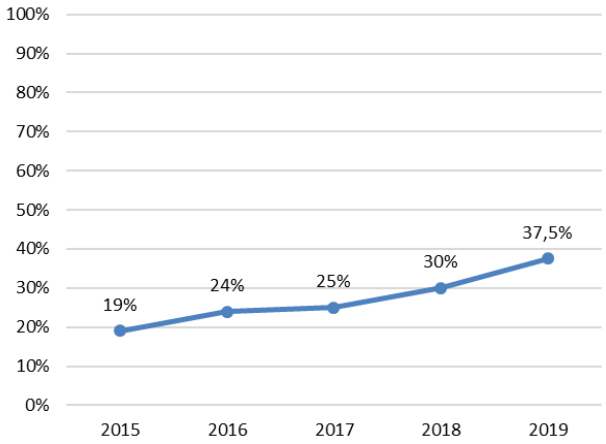
12.1- The share of the Total Domestic and International Sales Values of the products of the Enterprises Operating in the Organized Industrial Zones in all Industrial Enterprises

D P S I R

Organized Industrial Zones have been established in our country to discipline industry, contribute to the planned development of the city, ensure efficiency and increase profit in production, extend industry to less developed regions, discipline the use of agricultural land for industry, provide healthy, cheap and reliable infrastructure and common social facilities, prevent environmental pollution through common treatment facilities, etc.

The Ministry of Industry and Technology maintains the register of industrial enterprises based on the Industrial Registry Law No. 6948 Industrial registries have a dynamic structure, and there are both new entries and deletions of entries. In this regard, the share of enterprises registered in the Industrial Register in the total domestic and international sales values of products manufactured by enterprises in the organized industrial zones is 19% for 2015, 24% for 2016, 25% for 2017, 30% for 2018 and 37,5% for 2019[105]. The above information is taken from the industrial registry records and is not official statistical data.

GRAPH 135 – THE SHARE OF THE TOTAL DOMESTIC AND INTERNATIONAL SALES VALUES OF THE PRODUCTS OF THE ORGANIZED INDUSTRIAL ZONES IN ALL INDUSTRIAL ENTERPRISES BY YEARS



Source: Ministry of Industry and Technology, 2021

12.2- Number of Mining Facilities by Groups

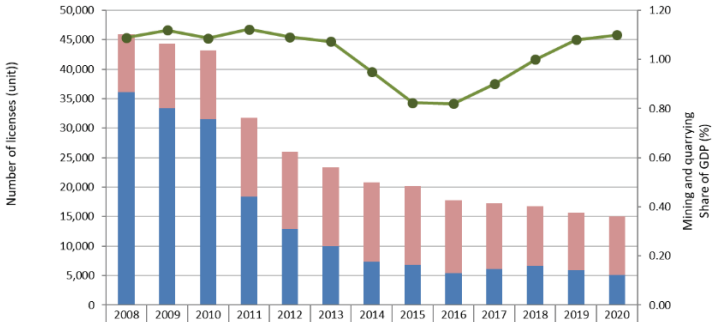
D P S I R

This indicator is a pressure indicator and shows the number of mines registered in a year by different licensing groups. Mining plays an important role because of its direct contribution to the economy and, in particular, because of the inputs it provides to the manufacturing sector. However, mining decisions should be made and implemented taking into account economic and environmental criteria to ensure the general welfare of the country.

In 2020, the Ministry of Energy and Natural Resources, General Directorate of Mining Affairs issued a total of 15,200 mining licenses, of which 5,136 were exploration licenses and 9,984 were operation licenses. From 2008 to 2020, the total number of licenses issued has decreased over the years. The share of mining and quarrying in GDP was 1.1% in 2020.

Looking at the distribution of the 7,548 licensed mines in operation in 2020 by their groups, it can be seen that 2,529 of them were in the IV Group, followed by the II Group (a) with 2,368 and the II Group (b) with 2,041[106].

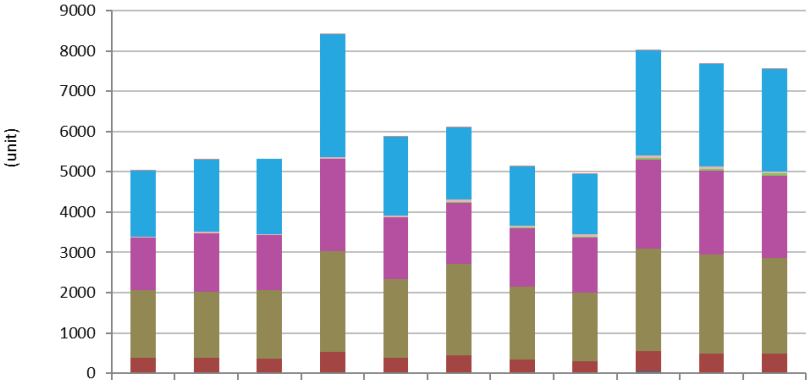
GRAPH 136- TOTAL NUMBER OF GIVEN LICENSES BY YEARS (2008-2020)



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Number of Operation 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
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
Mining and quarrying share of 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

Source: Ministry of Energy and Natural Resources, General Directorate of Mining Affairs (MIGEM),2021 http://www.mapeg.gov.tr/maden_istatistik.aspx

GRAPH 137- NUMBER OF LICENSES FOR OPERATED MINES BY MINING GROUPS (2010-2020)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
V. Group	3	2		3	1	1	2	3	7	7	7
IV. Group	1,637	1,798	1,869	3,056	1,944	1,783	1,467	1,499	2,594	2,547	2,529
III. Group	26	33	35	47	44	61	59	52	62	60	59
II(c) Group						11	13	22	47	46	53
II(b) Group	1,301	1,450	1,360	2,279	1,536	1,521	1,451	1,379	2,210	2,097	2,041
II(a) Group	1,686	1,642	1,707	2,507	1,957	2,264	1,809	1,694	2,534	2,445	2,368
I(b) Group	377	380	357	526	380	449	338	302	508	490	491
I(a) Group	0	0	0	0	0	0	0	0	49	0	0

Source: Ministry of Energy and Natural Resources, General Directorate of Mining Affairs (MIGEM), 2021 http://www.mapeg.gov.tr/maden_istatistik.aspx

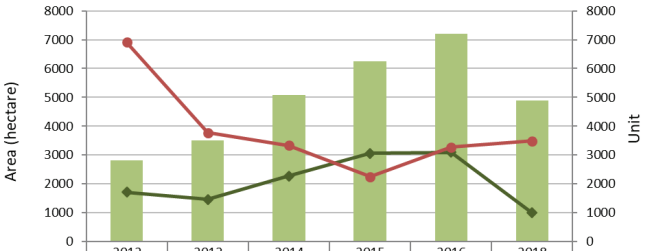
12.3- Number and Area of Mines Closed After Being Operated

D P S I R

The indicator is a response indicator. Reclamation activities should be carried out during the completion phase of an activity. The aim is to bring the areas degraded by mining activities to a state close to the old economic and ecological state through reclamation.

According to the General Directorate of Forestry, in 2018, 1001 mines/facilities were rehabilitated after being operated and their area was 4,888.77 hectares.

GRAPH 138- NUMBER AND AREA OF MINES/FACILITIES REHABILITATED AFTER BEING OPERATED (2010-2018)



	2012	2013	2014	2015	2016	2018
Area of Mines/Facilities Rehabilitated After Being Operated	2810	3499	5086	6243	7208	4888.77
Number of Mines/Facilities Rehabilitated After Being Operated	1711	1462	2277	3064	3101	1001
Number of Closed Mines	6,910	3,781	3,339	2,251	3,271	3,485

Sources:

(1) General Directorate of Forestry for the data of the Mines/Facilities Rehabilitated After Being Operated;

(2) Database for the data of the Number of Closed Mines; Ministry of Energy and Natural Resources, General Directorate of Mining Affairs (MIGEM) Oracle Discovery Data Base

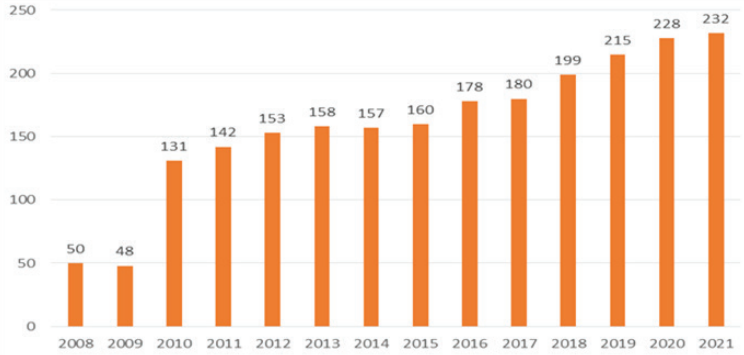
12.4- Laboratories Operating Under Environmental Legislation

D P S I R

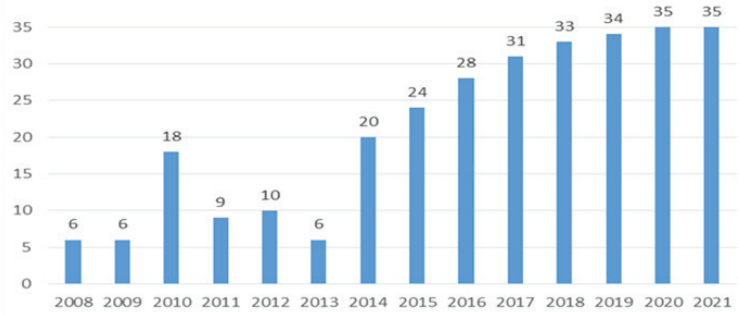
The indicator is a response indicator. In 2021, there are 232 laboratories operating under environmental legislation in our country. Issues such as laboratories, qualifications, and provinces can be queried at https://elab.cevre.gov.tr/LabSorgu/.

"Proficiency Tests" have been organized since 2008 for laboratories approved by our Ministry within the framework of Remote Inspections. The number of Organized Proficiency Tests are 35 parameters by 2021.

GRAPH 139- NUMBER OF LABORATORIES OPERATING UNDER ENVIRONMENTAL LEGISLATION BY YEAR



GRAPH 140- NUMBER OF PARAMETERS OF PROFICIENCY TESTS CONDUCTED OVER THE YEARS



Source: Ministry of Environment, Urbanization and Climate Change, General Directorate of the EIA, Permit, and Inspection, Department of Laboratory, Measurement and Monitoring,2021

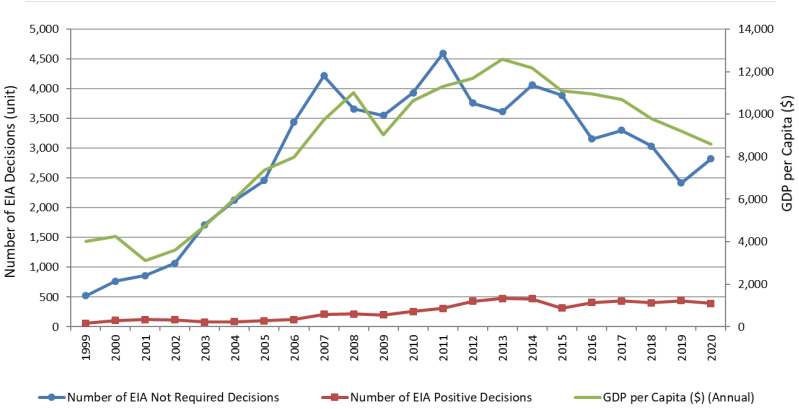
12.5- Decisions on Environmental Impact Assessment

D P S I R

The indicator is a response indicator. Environmental Impact Assessment (EIA), one of the most important tools of sustainable development, has been used in our country since 1993. An EIA is an important tool to prevent possible impacts of planned projects on the environment and to determine the chosen location and technological alternatives. Before the projects are put into practice, according to the EIA legislation, it has become obligatory to obtain a certificate of EIA Positive/EIA Not Required.

The EIA decisions are significant in that they reflect the state of industrialization and development in our country.

GRAPH 141- THE NUMBER OF EIA POSITIVE AND EIA NOT REQUIRED DECISIONS BETWEEN 1999 AND 2020 AND THE GDP PER CAPITA IN TURKEY



Sources: 1) Ministry of Environment, Urbanization and Climate Change, General Directorate of EIA, Permit and Inspection for EIA data, 2021

2) TURKSTAT for GDP per capita data, 2021

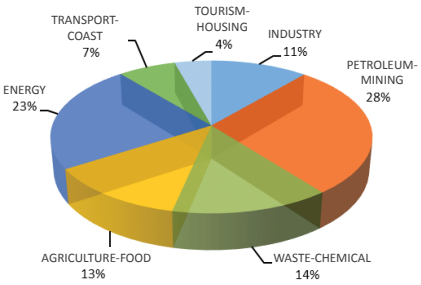
Note: EIA decisions subject to EIA statistics are not revised retroactively with respect to the issues of failure to start the investment without force majeure within the time limit established under the EIA Legislation, or revocation or invalidity of the EIA decision with the Court Decision.

In summary, "EIA Positive Decisions" are defined as positive decisions made as a result of the assessment of projects that are included in the list in Annex-1 of the Legislation and have relatively high environmental impacts. "EIA Not Required Decisions" on the other hand, are positive decisions made as a result of the assessment of projects listed in Annex-2 of the legislation that have relatively low environmental impacts compared to ANNEX -1.

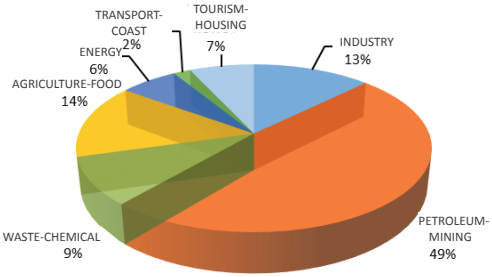
In Turkey, the first EIA Legislation was published in 1993, and by the end of 2020, a total of 6,118 " EIA Positive"decisions had been made. Looking at the distribution of these decisions by sector, it can be seen that investments in petroleum and mining lead the way with 28%, followed by investments in the energy sector with 23%, and investments in the waste and chemical sector with 14%, and the agriculture and food sector with 13%.

Looking at the distribution of the 65,934 "EIA Not Required" decisions by sector between 1993 and the end of 2020, investments in petroleum and mining again lead the way with 49%. This is followed by investments in agriculture and food with 14% and industrial investments with 13%.

GRAPH 142- SECTORAL DISTRIBUTION OF EIA POSITIVE DECISIONS BETWEEN 1993-2020



GRAPH 143- SECTORAL DISTRIBUTION OF EIA NOT REQUIRED DECISIONS BETWEEN 1993-2020



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

Note: EIA decisions, which are subject to EIA Statistics, are not revised retrospectively regarding the issues of not starting investment without force majeure within the period specified within the scope of the EIA Legislation, or canceling or voiding the EIA decision with the Court Decision

13
AGRICULTURE

13.1- Agricultural Land Per Capita

D P **S** I R

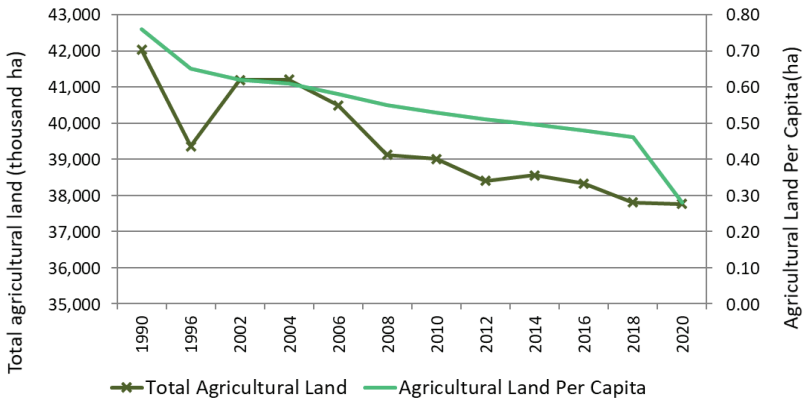
The indicator is a state indicator. Agricultural land is important for our herb production and pastures, while summer pastures and winter quarters are important for our livestock development and nature conservation.

According to the 2020 TURKSTAT data, the total agricultural land is 37,762 thousand hectares (meadow and pasture land are also included). 51.9% of the total agricultural land is cultivated land, 9.4% is land with perennial crops (perennial orchards), and 38.7% is permanent meadows and pastures.

As a result of the population growth in Turkey and the decrease in total agricultural land, the agricultural land per capita has decreased. From 1990 to 2018, Turkey's population has increased by about 45.2%, and agricultural land per capita has decreased by 39.3% during the same period.

The total agricultural land per capita, which was 0.76 ha in 1990, decreased to 0.46 ha in 2018. In terms of total arable land (23,136 thousand ha) in 2020, it was 0.28 ha per person. From 2020, if the total arable land (23,136 thousand ha) is taken into account, the area per capita is 0.28 hectares107. According to 2016 data, the agricultural land per capita in the world was 0.19 ha and in the European Union it was 0.22 ha[108].

GRAPH 144- TOTAL AND PER CAPITAL AGRICULTURAL LANDS BY YEAR



Source: TURKSTAT, 2021, Ministry of Agriculture and Forestry,2021

Notes:

1) Since 1995, only closed orchards and olive groves are included, the area with scattered trees is not included.

2) Since 1995, they are included according to the activities of the European Union as defined by the Statistical Classification of Products by Economic Activities (CPA 2002).

3) More than one plantation is not included since 2011.

13.2- Chemical Fertilizer Consumption

D P S I R

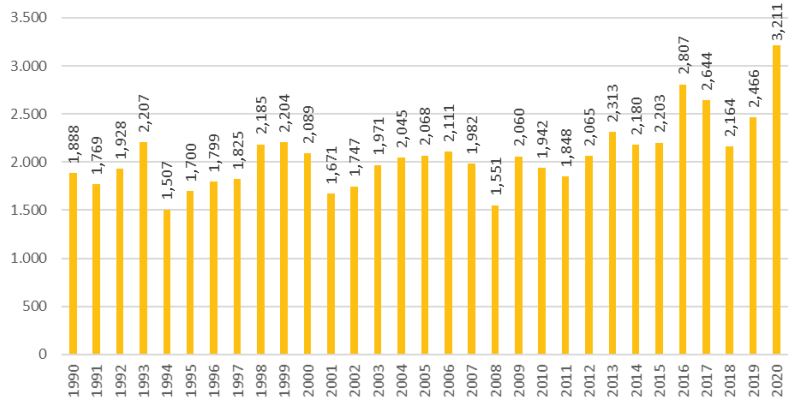
This indicator is a pressure indicator for eutrophication factors. The part of fertilizer used in agriculture that is not taken up by plants is one of the main causes of eutrophication of the environment.

The amount of chemical fertilizers as pure plant nutrients (N, P2O5, K2O) consumed in Turkey at the end of 2020 increased by 30.18% compared to 2019 and reached 3,210,698 tons. The total agricultural cultivated area was 19,572,000 hectares. At the end of 2020, the consumption of chemical fertilizers as a pure plant nutrient per hectare of agricultural land in Turkey was about 164 kg. Excessive consumption of fertilizers is not in question in dry agricultural areas, but in some local and irrigated areas[109].

According to FAO 2018 data, fertilizer use based on plant nutrients per hectare of arable land averaged 160 kg/ha in European Union countries, 135 kg/ha in the world, and 110 kg/ha in Turkey[110].

The goal of fertilizer use is to use fertilizer at the right time, in the appropriate manner, and in the right amount based on soil analysis, to avoid practices that cause water pollution and reduce soil fertility, to promote organic farming, and to practice sustainable agriculture. To increase the efficiency of fertilizer use, it is important to expand the use of organic and organomineral fertilizers in addition to chemical fertilizers[111].

GRAPH 145- TOTAL CHEMICAL FERTILIZER CONSUMPTION BASED ON PLANT NUTRIENT MATERIAL BY YEAR



Source: Ministry of Agriculture and Forestry, 2021

13.3- Use of Pesticides

D P S I R

The indicator is a pressure indicator. In 2020, the total amount of pesticide used in Turkey increased by 4,6% compared to 2019 and reached 53,672 tons. When the amount of pesticide use is studied based on groups, fungicides represented the largest group both in our country and in the world. In 2020, the total pesticide use included 38.4% fungicides, 24.7% herbicides, 23.0% insecticides, 4.1% acaricides, 0.5% rodenticides, and 9.3% others (plant activator, plant growth regulator, insect attractant, fumigant, nematicide, sulfur, mineral oils).

The use of pesticides in Turkey may decrease in some years and increase in some years, depending on the condition of harmful organisms and climatic changes. Although the volume of crop production has increased in recent years, pesticide use has not increased at the same rate.

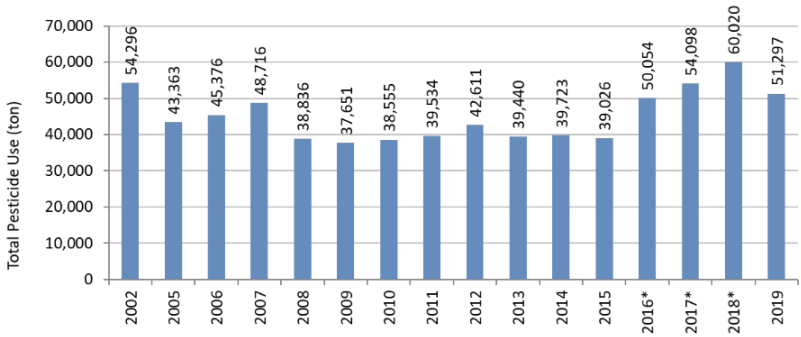
In Turkey, 51,297 tons of pesticides were used in 2019 to prevent yield and quality losses in crop production. Looking at the amount of pesticide use by group, fungicides represented the largest group both in our country and in the world. In 2019, fungicides accounted for 38.40% of total pesticide use, herbicides accounted for 24.65%, insecticides accounted for 22.63%, acaricides accounted for 4.14%. 0.51% rodenticides and 9.67% others (plant activator, plant growth regulator, insect attractant, fumigant, nematicide, sulfur, mineral oils).

Regionally, in our country, pesticides were most frequently used in the Mediterranean region (28.16%) in 2019. This is followed by the Aegean (25%), Marmara (17.37%) and Central Anatolia (12.94%) regions, respectively. The Eastern and Southeastern Anatolia regions account for only 12.26% of Turkish consumption. The Black Sea region is in last place with 4.27 %.

The first 5 provinces where the most pesticides are applied in 2019 are Antalya (4,326 tonnes) with 8.4%, Manisa (4,132 tonnes) with 8.1%, Adana with 6.7% (3,445 tonnes), Mersin with 6.2% (3,199 tonnes) and Aydın (3,007 tonnes) with 5.9%.

The Ministry of Agriculture and Forestry continues to make efforts to prevent the use of defective pesticides. These efforts include: disseminating globally recognised Integrated Pest Management measures in the fight against harmful organisms found in herbal products; conducting pre-harvest pesticide control studies; incorporating and disseminating biological and biotechnical control methods among alternative control methods; focusing on non-formal and applied education; and publishing studies such as the Field School for Farmers[112].

GRAPH 146- TOTAL AMOUNT OF PESTICIDE USE BY YEAR



Source: Ministry of Agriculture and Forestry, 2021

(*) The amount of use seems to be high due to the change in calculation method after 2016.

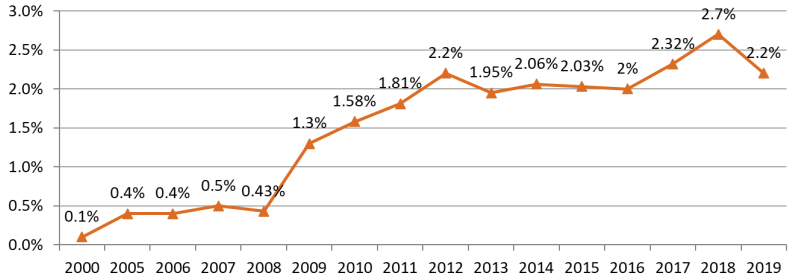
13.4- Organic Farming Lands and Production Amounts

D P S I R

Organic farming is an environmentally friendly agricultural practice, and the area and scale of organic farming is a response indicator. Organic farming started in Turkey in 1985 with only 8 types of products that met the requirements for export. In 2002, 12,428 farmers planted 89,827 hectares (including wild collection areas) and harvested 310,125 tons and 150 types of organic products. The organic production volume, which in 2002 was 310,125 tons in 150 product varieties, 12,428 producers on 89,827 hectares (including natural collection areas), reached 2,030,466 tons in 2019 in 213 product varieties, 74,545 producers and 545,870 hectares. In 2020, it is 1,631,943 tons in 235 product varieties, on an area of 382,665 hectares with 52,590 producers. Organic farming lands (including natural collection areas) decreased by 29.9% in 2020 compared to 2019, and product volume decreased by 19.6%.

According to 2019 data, organic farming land accounted for 2.2% of the total agricultural land in Turkey. According to the 2018 data, organic farming was practiced on 1.5% of the total agricultural land worldwide[113]. In the European Union countries, organic farming was practiced on 8.1% of the total agricultural land[114].

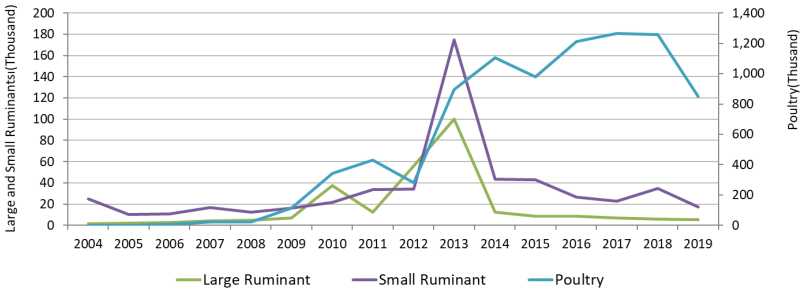
GRAPH 147- SHARE OF ORGANIC FARMED LAND IN THE TOTAL AGRİCULTURAL LAND (%)



Source: Ministry of Agriculture and Forestry,2021

Notes: (1) Transition data is included. (2) Production areas include wild harvesting areas.

GRAPH 148- ORGANIC LIVESTOCK DATA



Source: Ministry of Agriculture and Forestry,2021

13.5- Good Agricultural Practices

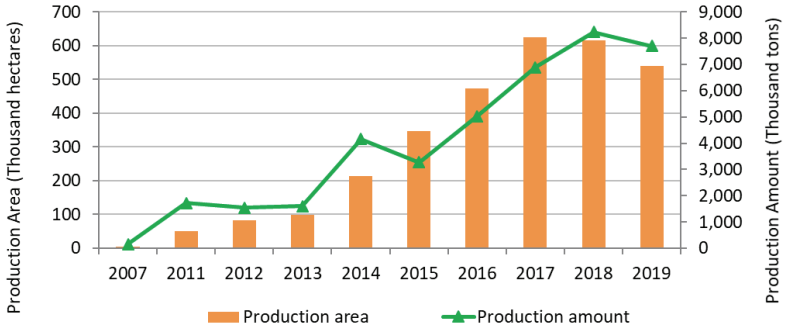
D P S I R

Good agricultural practices are agricultural production that does not harm the environment and human and animal health. These practices aim to protect natural resources, ensure traceability and sustainability in agriculture, and food safety. In this regard, the indicator is a response indicator.

Good Agricultural Practices are carried out in accordance with the legislation on good agricultural practices published by the Ministry of Agriculture and Forestry. According to this, the product must be traceable from the field to the dining table, and each process must be recorded. The use of pesticides, fertilizers, etc. is carried out according to the results of analysis and under control. The final product is certified according to the report issued by the inspection body.

The good agricultural practices have been implemented in Turkey since 2007 in 18 provinces with 651 producers and on an area of 5,361 ha. While the good agricultural practices had a production volume of 8,230,026 tons on 615,614 ha area in 2018, it was 7,706,404 tons on 539,607 ha area with 61,498 producers in 66 provinces in 2019. In 2019, the production area of good agricultural practices accounted for 2.7% of the total agricultural area[115].

GRAPH 149- THE PRODUCTION AREA AND THE AMOUNT OF GOOD AGRICULTURAL PRACTICES BY YEAR



Source: Ministry of Agriculture and Forestry,2021

14

FISHERIES

14.1- Aquaculture Production

D P S I R

This indicator is a pressure indicator.

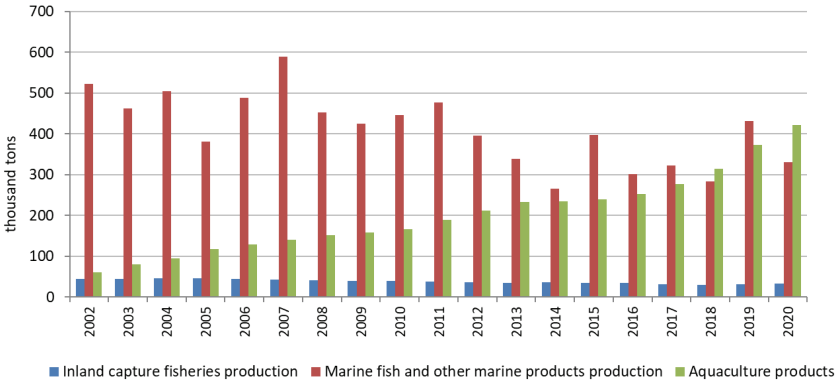
There are 24 million ha of marine area and 1.5 million ha of inland water area. According to TURKSTAT, aquaculture production in 2020 decreased by 6.1% compared to 2019 and amounted to 785,811 tons. Marine fish accounted for 37.1% of production, other marine products for 5%, inland aquaculture for 4.2%, and aquaculture products for 53,6%.

In 2020, marine and inland fisheries decreased by 21.3%, while aquaculture production increased by 12.9% compared to the previous year. While production from hunting was 364,400 tons, aquaculture production was 412,411 tons. 30.4% of aquaculture production took place in inland waters and 69.6% in the seas.

The Eastern Black Sea Region ranked first with 41.1% share of production from marine fisheries. It was followed by the Western Black Sea Region with 34.2%, the Aegean Region with 12.7%, the Marmara Region with 7.3% and the Mediterranean Region with 4.6%[116].

To protect fishery resources and ensure sustainable management, regulations are developed on zones, time, season, length, species, distance, depth as well as fishing tools and equipment for aquaculture. In addition, various measures are implemented to monitor fish stocks, protect endangered species, replenish stocks through fish restocking, monitor water resources for pollution, and take preventive measures.

GRAPH 150- FISHERIES PRODUCTION DATA BY YEAR (2002-2020)



Source: Ministry of Agriculture and Forestry, TURKSTAT, "Fishiries Bulletin, 2020"

14.2- Fishing Fleet Capacity

D P S I R

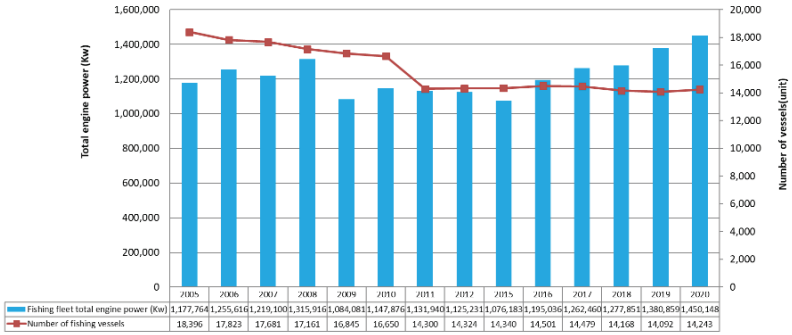
This indicator is a measure of the size and capacity of the fishing fleet, which is believed to exert pressure on marine fish populations and their environment. In our country, as in the whole world, the production of fishery products from hunting is limited. For this reason, the basic approach to hunting accepted by scientists is to maintain production while conserving stocks. The fishing fleet has grown and evolved in terms of strength, numbers, technology, and fishing gear through the 2000s. According to TURKSTAT, the number of active sea fishing vessels was 13,381 in 2000, increased to 18,396 by 2005, but decreased to 14,243 by 2020.

In order to protect fishery resources and ensure the sustainability of our fisheries, further growth of the fleet has been limited by not issuing new vessel licenses since 2002.

Taking into account the balance between fish stocks and the fishing fleet in Turkey, support payments have been granted since 2012 to fishermen who wish to exclude their vessels from fishing, depending on the size of the vessels, in exchange for the cancelation of their licenses.

In this regard, a total of 1,264 fishing vessels (with a length of 10 meters or more) were withdrawn from the fleet between 2012 and 2018. This policy has reduced the total number of vessels[117].

GRAPH 151- NUMBER OF SEA FISHING VESSELS BY YEAR



Source: TURKSTAT, 2021

TABLE 32- NUMBER OF BOATS WITDRAWN BY YEAR

Years	2013	2014	2015	2016	2017	2018	Total
Number of Boats Withdrawn	364	456	191	-	214	39	1.264

Source: Ministry of Agriculture and Forestry, General Directorate of Fisheries and Aquaculture, 2019

15

TOURISM

15.1- Number of Tourists

D P S I R

The high number of visitors coming to the country in a given period of time puts a strain on the environment, for example, through the excessive consumption of natural resources at certain times of the year, wastewater, waste generation, noise, etc.

The number of tourists is the number obtained by subtracting the number of overnight tourists from the total number of foreign visitors coming to Turkey and the number of citizens living abroad.

The number of tourists in Turkey, which was 15,775,021 in 2003, reached 51,191,882 in 2019. In 2019, the number of tourists increased by 11.85% compared to 2018.

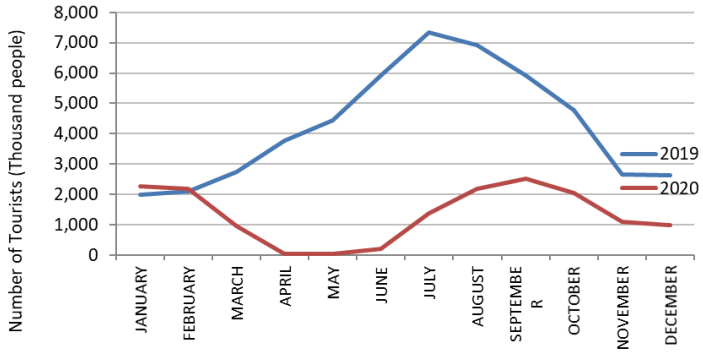
However, due to the Covid 19 epidemic that affected the whole world, the number of tourists in 2020 was 15,893,967, and the number of tourists decreased by 68.95% in 2020 compared to 2019.

GRAPH 152- NUMBER OF INBOUND TOURISTS IN THE PERIOD 2003-2020

Source: TURKSTAT, Ministry of Culture and Tourism, 2021

Looking at the distribution of tourist numbers by month, it can be seen that tourists visit Turkey mainly in the summer months. The per capita water consumption in tourist facilities, which exceeds the norms, and the fact that this consumption takes place in summer, when water resources are at their lowest, lead to environmental problems related to water. There is also a risk that excessive water extraction from deep wells will exacerbate the water problem.

GRAPH 153- MONTHLY DISTRIBUTION OF INBOUND TOURISTS TO TURKEY IN 2019-2020



Source: Ministry of Culture and Tourism, 2021

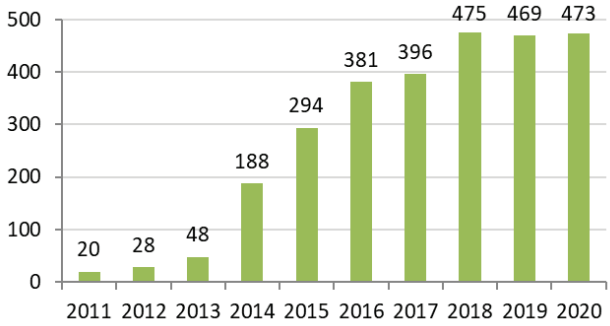
15.2- Number of Environment-Friendly Accommodation Facilities

D P S I R

The indicator is a response indicator. The Ministry of Culture and Tourism, under the legislation, awards an "Environment Friendly Accommodation Facility Certificate" and a plaque to the accommodation facilities that have a "Tourism Facility Certificate" and operate in an environmentally friendly manner in order to protect the environment, raise environmental awareness, and promote and support the positive contribution of tourism facilities to the environment.

At the end of 2020, the number of accommodation facilities with a Tourism Facility Certificate was 4,218, of which 473 facilities (11.21%) were certified with the "Environment-Friendly Accommodation Facility" certificate (Green Star badge)[118].

GRAPH 154- NUMBER OF FACILITIES WITH GREEN STAR CERTIFICATES BY YEAR



Source: Ministry of Culture and Tourism, 2021

15.3- Number of Tourist Overnights and Beds per 1000 Inhabitants

D P S I R

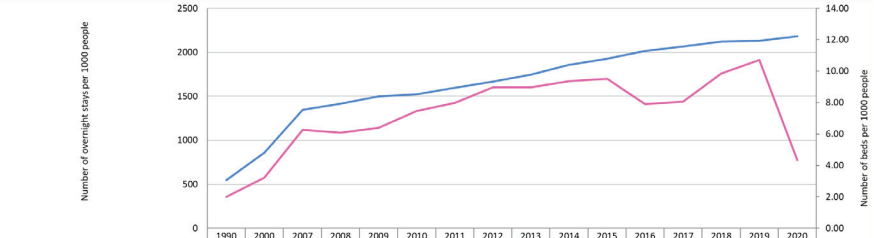
The indicator is obtained by calculating the figures per inhabitant based on the total number of overnight stays in touristic facilities and the ratio between the number of beds in the facilities with tourism management certificates and the total population. It is a pressure indicator.

The increasing number of tourists can have a negative impact on the environment. The excessive consumption of resources in this region (water consumption and waste generation) at certain times of the year can cause serious environmental problems.

The number of beds in tourist-run accommodation establishments per 1000 inhabitants in Turkey has been steadily increasing over the years. There have been ups and downs in the number of overnight stays per1000 inhabitants. In 2020, the number of beds per1000 inhabitants in Turkey was 12.21 and the number of overnight stays was 775[119].

According to EUROSTAT data, the number of beds per 1000 inhabitants in the EU-28 countries in 2018 was 55.2, and the number of overnight stays was 5,445[120].

GRAPH 155- NUMBER OF TOURIST OVERNIGHTS AND BEDS PER 1000 INHABITANTS



	1990	2000	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Number of overnight stays per 1000 people	357	577	1116	1087	1143	1331	1425	1602	1600	1674	1700	1410	1438	1761	1914	775
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

Note: When comparing the number of overnight stays in the facility by year, the factor of constant change in the number of facilities and beds should be considered.

Sources: Data on overnight stays and beds from the Ministry of Culture and Tourism, population data from TURKSTAT.

15.4- Blue Flag Applications

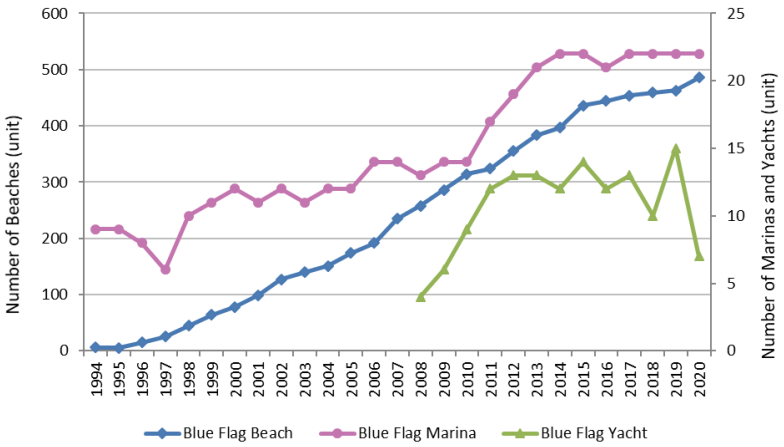
D P **S** I R

The indicator is a state indicator. The Blue Flag is an international environmental award given to qualified beaches, marinas, and yachts that meet the required standards. The application of the Blue Flag, which was introduced in Europe in 1987 and in Turkey in 1993, aims to create high standards for beaches, marinas, and yachts.

In the period from 1994 to 2020, the number of Blue Flag beaches in Turkey has steadily increased, reaching 486 beaches, 22 marinas and 7 yachts in 2020.

Within the Blue Flag program, which is carried out in cooperation with the Turkish Foundation for Environmental Education (TURCEV) in our country, Turkey ranks third with 486 beaches, behind Spain with 590 beaches and Greece with 497 beaches. It ranks seventh in the world in terms of marinas.

GRAPH 156- NUMBER OF BLUE FLAG BEACHES, MARINAS AND YACHTS BY YEARS IN TURKEY



Source: Ministry of Culture and Tourism, 2021

16 DISASTERS

16.1- Forest Fires

D P S I R

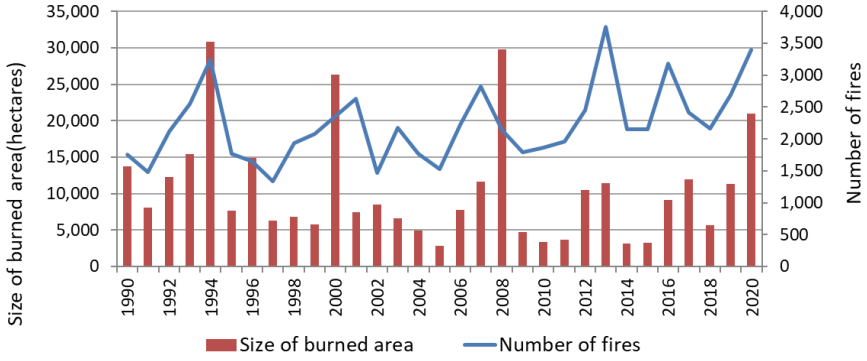
The indicator is an impact indicator. A large part of Turkey's forests, located in the Mediterranean climate zone, is threatened by forest fires.

In 2020, 3,399 forest fires broke out, damaging 20,971 hectares of forest land. The average area burned per fire was 6.2 hectares. In 2020, the number of fires increased by 26.5% compared to the previous year. The burned forest area increased by 85% compared to the previous year.

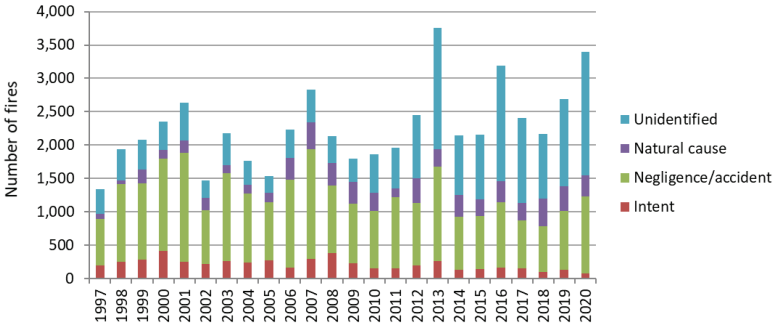
The vast majority of fires in our forests are caused by humans. In 54% of forest fires in 2020, the cause could not be identified. 34% of forest fires were caused by negligence/accidents, 9% by natural causes, and 3% by intent[121].

According to the European Forest Fire Information System (EFFIS) data, the average size of burned areas per ten-year fire (2009-2019) in European countries in the Mediterranean climate zone was 25.60 ha in Greece, 11.79 ha in Italy, 8 in Spain, 2 ha, 7.1 ha in Portugal, 2.9 ha in Turkey, and 3.2 ha in France[122].

GRAPH 157- FOREST FIRES (1990-2020)



GRAPH 158- NUMBER OF FIRES ACCORDING TO THEIR CAUSES (1997-2020)



Source: Ministry of Agriculture and Forestry, General Directorate of Forestry, Forest Statistics 2020, https://www.ogm.gov.tr/ekutuphane/Sayfalar/Istatistikler.aspx

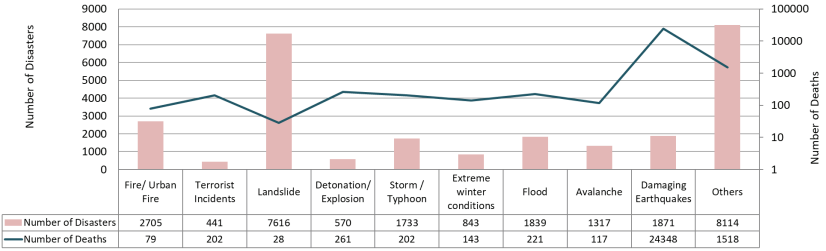
16.2- Disasters by Type

D P S I R / D P S I R

Natural disasters are impact indicators, while technical accidents are pressure indicators. According to the Turkish Disaster Data Bank (TABB) data, a total of 27,049 disasters (excluding road/vehicle accidents) occurred between 1990 and 2018. Among them, other disasters ranked first with 8,114. This was followed by landslides with 7,616 and earthquakes (damaging earthquakes) with 1,871.

A total of 27,119 people died in disasters (excluding road/vehicle accidents) in Turkey between 1990 and 2018. Earthquakes (damaging earthquakes) claimed the most lives with 24,348 people[123].

GRAPH 159- NUMBER OF DISASTERS IN TURKEY BY TYPE AND FATALITIES BETWEEN 1990-2018, ACCORDING TO DATA FROM THE TURKISH DISASTER DATA BANK (TABB)



	Fire/ Urban Fire	Terrorist Incidents	Landslide	Detonation/ Explosion	Storm / Typhoon	Extreme winter conditions	Flood	Avalanche	Damaging Earthquakes	Others
Number of Disasters	2705	441	7616	570	1733	843	1839	1317	1871	8114
Number of Deaths	79	202	28	261	202	143	221	117	24348	1518

Source: https://tabb-analiz.afad.gov.tr/Genel/Raporlar.aspx

Note: Road / vehicle accidents are excluded.

16.3- Numbers of Risk Assessment and Emergency Response Plans

D P S I R

In order to be prepared for accidents caused by vessels and coastal facilities, coastal facilities that engage in activities that may result in pollution of the seas with oil and other harmful substances must prepare risk assessment and emergency response plans in accordance with Law No. 5312, "On Principles of Emergency Response and Compensation for Damages in Pollution of Marine Environment by Oil and Other Harmful Substances," and the Implementation By-Law and submit them to the Ministry of Environment, Urbanization and Climate Change for approval. In this regard, the Ministry of Environment and Urbanization has approved the risk assessment and emergency response plans of 36 coastal facilities, representing 98% of all coastal facilities in our country in 2020. One national and six regional emergency response plans were prepared by the Ministry of Environment, Urbanization and Climate Change and came into effect on 08/02/2012. Annual efforts are made to keep the plans up to date. The prepared risk assessment and emergency response plans for coastal facilities are included as sub-elements of the national and regional plans.

TABLE 33- THE RATIOS OF THE COASTAL FACILITIES WHOSE PLANS HAVE BEEN APPROVED BY THE MINISTRY OF ENVIRONMENT, URBANIZATION AND CLIMATE CHANGE BY YEAR

PROVINCES	YEARS											
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ADANA	75%	75%	83%	83%	83%	91%	100%	92%	93%	100%	100%	100%
ANTALYA	7%	36%	36%	43%	43%	75%	88%	88%	89%	100%	100%	100%
ARTVİN	0%	50%	50%	50%	100%	100%	100%	100%	100%	100%	100%	100%
AYDIN	0%	0%	0%	0%	0%	0%	50%	100%	100%	100%	100%	100%
BALIKESİR	10%	20%	20%	30%	30%	43%	43%	57%	57%	71%	71%	71%
BARTIN	0%	0%	0%	0%	0%	25%	40%	67%	67%	67%	67%	67%
BURSA	20%	60%	60%	60%	60%	86%	86%	86%	100%	100%	100%	100%
ÇANAKKALE	13%	25%	25%	38%	50%	67%	83%	75%	100%	100%	100%	100%
DÜZCE	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
EDİRNE	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	100%	100%
GİRESUN	0%	40%	40%	40%	40%	100%	100%	100%	100%	100%	100%	100%
HATAY	14%	81%	86%	86%	90%	90%	95%	95%	91%	100%	100%	100%
İSTANBUL	4%	81%	82%	84%	84%	93%	94%	98%	99%	100%	100%	100%
İZMİR	65%	79%	79%	79%	81%	95%	100%	91%	100%	100%	100%	100%

PROVINCES	YEARS											
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
KASTAMONU	0%	0%	0%	0%	0%	0%	33%	67%	67%	67%	67%	100%
KIRKLARELİ	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	100%	100%
KOCAELİ	25%	63%	78%	85%	85%	95%	100%	93%	93%	98%	98%	98%
MERSİN	44%	68%	76%	80%	80%	91%	91%	88%	92%	100%	100%	100%
MUĞLA	0%	4%	4%	12%	12%	57%	71%	83%	100%	100%	100%	100%
ORDU	0%	14%	14%	14%	14%	60%	60%	60%	75%	100%	100%	100%
RİZE	7%	7%	7%	7%	7%	100%	100%	100%	100%	100%	100%	100%
SAKARYA	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	100%	100%
SAMSUN	11%	67%	78%	89%	89%	90%	91%	100%	100%	100%	100%	100%
SİNOP	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
TEKİRDAĞ	25%	42%	50%	67%	75%	75%	92%	100%	91%	100%	100%	100%
TRABZON	0%	8%	15%	23%	23%	60%	67%	100%	100%	100%	100%	100%
YALOVA	7%	7%	7%	21%	21%	98%	98%	98%	95%	100%	100%	100%
ZONGULDAK	40%	60%	80%	80%	100%	100%	71%	83%	98%	100%	100%	100%
TOPLAM	21%	52%	56%	60%	62%	85%	90%	92%	94%	97%	97%	98%

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

16.4- Liability Insurances within the Scope of Environmental Legislation

D P S I R

The indicator is a response indicator. The notion of risk brings with it the notion of insurance, which implies a hedging of the risk. In this sense, the environmental liability insurance is used nowadays as a tool for the management of environmental risks.

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

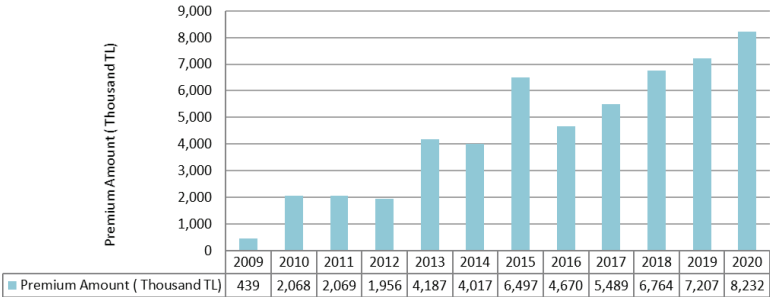
With Coastal Facilities Sea Pollution Compulsory Third Party Liability Insurance some material and physical damages caused by marine pollution of coastal facilities are

compensated within the guarantee limits set by the State. For this insurance, a total of TL 8,232,080 in premiums was generated in 2020.

Environment Pollution Third Party Liability Insurance provides coverage for damages caused by companies that pollute the soil, water or air. For this insurance, a total of TL 2,000,032 in premiums was generated in 2020.

Compulsory Third Party Liability Insurance for Hazardous Substances and Hazardous Wastes compensates physical and material damages that may be caused by professional activities related to hazardous materials. For this insurance, a total of TL 77,489,065 in premiums was generated in 2020[124].

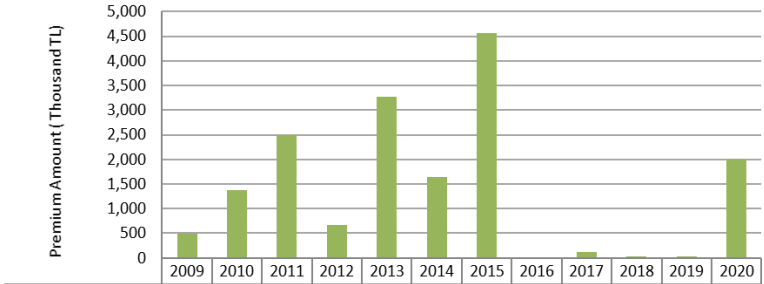
GRAPH 160- COASTAL FACILITIES SEA POLLUTION COMPULSORY THIRD PARTY LIABILITY INSURANCE



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Premium 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

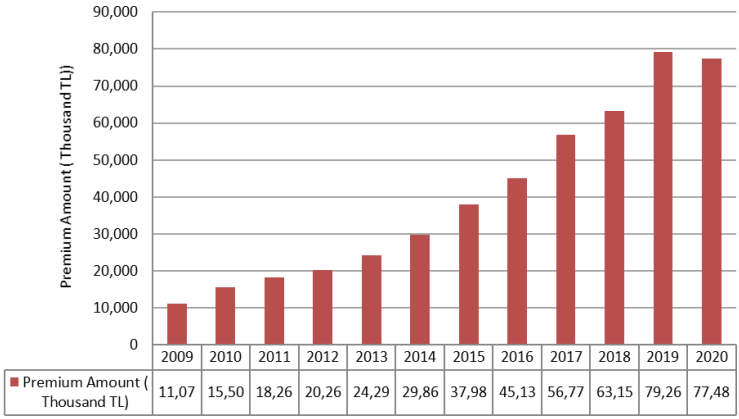
Source: Insurance and Private Pension Regulation and Supervision Agency, 2021

GRAPH 161- ENVIRONMENT POLLUTION THIRD PARTY LIABILITY INSURANCE



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Premium Amount (Thousand TL)	498	1,369	2,500	665	3,275	1,649	4,561	1	113	25	25	2,000

GRAPH 162- HAZARDOUS MATERIALS AND HAZARDOUS WASTE COMPULSORY THIRD PARTY LIABILITY INSURANCE



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Premium Amount (Thousand TL)	11,07	15,50	18,26	20,26	24,29	29,86	37,98	45,13	56,77	63,15	79,26	77,48

Source: Insurance and Private Pension Regulation and Supervision Agency, 2021

DEFINITIONS

POPULATION

Population Growth Rate

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

Urban Population

This indicator shows the expression of the population within the boundaries of provincial and district centers municipalities as a percentage of the total population.

Migrant Population

Internal migration is the change of permanent residence in certain areas within the borders of the country within one year.

ECONOMY

Resource Efficiency/Productivity

Resource efficiency/productivity is the ratio of GDP to domestic material consumption. Domestic material consumption measures the total amount of materials used directly in the economy. The indicator is obtained by adding the annual quantity of raw materials extracted at the borders of the economy concerned and the quantity of physical imports, and subtracting the physical quantity exported. It was emphasized that the term "consumption" used here does not refer to final consumption, but to apparent consumption. The indicator does not include upward flows of imports and exports of raw materials from outside the economy.

Domestic Material Consumption

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

Environmental Protection Expenditures

Environmental protection expenditures are expenditures on activities to prevent, reduce, and eliminate environmental impacts caused by production processes and consumption of goods and services. In the public sector, expenditure on administration, monitoring and implementation of laws is also included. Environmental protection includes activities related to the prevention and reduction of pollution as well as activities related to the degradation of the environment. The primary purpose of activities under this heading is to protect the environment. Activities carried out for other purposes but which also have a positive impact on the environment are not included in environmental protection. Similarly, activities that are carried out for technical reasons, internal needs such as hygiene or safety and that have environmental benefits are not included.

Sectoral Distribution of Employment

This indicator gives the percentage of the active population of agriculture, industry, construction and services sectors out of the total active population.

HEALTH

Piped water supply (Mains Water)

Piped water supply is the supply of water under pressure through pipes from the municipal water supply system to the interior of the dwelling. Force pumps, wells, spring supplies, cisterns, rain puddles, fountains outside the houses are not considered as piped water system. If the "piped water system" brought into the yard is shared, the piped water system is accepted as "existing".

CLIMATE CHANGE

Greenhouse Gas Emissions

Emissions from energy, industrial processes and product use, agricultural activities and waste disposal comprise of direct greenhouse gases such as carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs) and sulfur hexafluoride (SF6) and indirect greenhouse gases such as nitrogen oxides (NOX), non-methane volatile organic compounds (NMVOCs) and carbon monoxide (CO) emissions. National Greenhouse Gas Emissions are calculated using the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines.

Greenhouse Gas Emissions by Sector

The indicator refers to the amount of greenhouse gas emissions from the different sectors in CO2 equivalents.

Carbon Sink

Natural or man-made systems that absorb and store carbon dioxide from the atmosphere. Forests are the most common type of sink. In addition, soil, peat, permafrost (permafrost) soil layers, ocean water and carbonate deposits in the deep ocean are other sinks.

Carbon Sequestration

It is the process of sequestering carbon in a way that prevents it from being released into the atmosphere for a period of time. It is the process of removing carbon from the atmosphere and depositing it in a reservoir.

Precipitation

It is the term for the average amount of precipitation per unit area.

Temperature

This refers to the monitoring of average surface temperatures in time series.

Seawater Temperature

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

Heating Degree Days – HDD

This expresses the severity of cold considering the outdoor and indoor temperature at a given time (day, month, year). In order to create a comparable and common use, the European Community Statistics Office (Eurostat) recommends the following method to calculate the 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 daily degrees are found by summing them up.

Cooling Degree Days – CDD

This explains 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, in the practice of energy management in the construction industry, the threshold temperature is considered to be 22°C. According to this:

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

CDD = 0 if Tm ≤ 22 °C

AIR POLLUTION

Air Pollutant Emissions

Air Pollutants Emission is the mass expression (KiloTon, GigaGram, etc.) of the sum of emissions obtained by multiplying annual activity data and emission factors for specific pollutants.

Air Quality

This indicator shows the concentration of SO_2 and PM (Particulate Matter) in the ambient air. SO_2 is a polluting, asphyxiating, colorless, acidic gas produced when sulfur compounds naturally occurring in the structure of fuels are released during combustion. Particulate Matter (PM) is formed when gaseous emissions are chemically converted and formed into bulk material. Particles with a diameter of 5 to 10 micrometers are defined as airborne particles. They are usually heterogeneous mixtures whose properties vary greatly from place to place Particulate Matters are referred to as PM_{10} if the aerodynamic diameter of the particles is less than 10 micrometers.

Limit value: This refers to the value that is scientifically determined with the aim of avoiding, preventing or reducing harmful effects on the environment and/or human health, and which must be reached within a certain period of time and should not be exceeded once reached.

Large Combustion Plant: These are combustion plants with a rated thermal input of 50 MW or more, built exclusively for the production of electricity and using solid, liquid or gaseous fuels.

WATER-WASTEWATER

Water Consumption

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

Oxygen-Consuming Substances in River Waters

The primary indicator of oxygenation status in water bodies is biochemical oxygen demand (BOD), which expresses the oxygen demand of living organisms in water that consume oxidizable organic matter. This indicator shows the current status and trends regarding ammonia (NH4) concentrations and BOD in rivers.

Nutrients in Fresh Water Resources

This indicator can be used to show current nutrient concentrations - orthophosphate and nitrate concentrations in rivers, total phosphorus and nitrate in lakes, and nitrate in groundwater formations - and geographic changes in trends over time.

Classification by trophic status (nutrients) is as oligotrophic (with few nutrients), mesotrophic (with normal, medium nutrients), eutrophic (with good nutrients).

Oligotrophic

Limited nutrient salt input to water bodies, organic matter formation and biomass concentration are very low.

Mesotrophic

Nitrogen and phosphorus are low. Organic matter and calcium are at normal levels. Biological productivity is seen higher compared to oligotrophic.

Eutrophic

Rich in essential plant nutrients and organic matter. The amount of nitrogen, phosphorus and organic material is high. The amount of phytoplankton is high. High biological activity is observed.

Bathing Water Quality

This indicator shows the bathing water quality in coastal areas. Within the framework of the By-law on the Management of Bathing Water Quality, Class A represents excellent quality, Class B good quality, Class C sufficient quality and Class D poor quality.

Municipal Drinking and Potable Water Resources

It expresses the proportion of water taken by municipalities from dams, wells, natural springs, rivers, lakes and ponds to supply them with drinking and potable water.

Municipalities Supplied by Wastewater Treatment Plants

This indicator shows the number of municipalities providing service with wastewater treatment plants and the population that benefits from this service.

Wastewater treatment includes one or more of the physical, chemical and biological processes applied to prevent changes in the physical, chemical, bacteriological and environmental characteristics of the receiving environment from which the wastewater originates as a result of various uses.

Wastewater Treatment Plant: It is a unit in which foreign matter causing pollution of wastewater is removed from wastewater by various methods (physical, biological, advanced).

Treatment Methods

- Physical Treatment: This is the treatment system in which the undissolved pollutants are separated from the wastewater by precipitation or flotation. Grids, sieves, sand arresters, balancing, sedimentation and flotation ponds are the most common physical treatment units.

- Chemical Treatment: This is the separation of substances dissolved or suspended in wastewater, which cannot precipitate spontaneously, using chemicals such as coagulants and polyelectrolytes, etc.

- Biological Treatment: This is the process of eliminating organic-based solids dissolved in wastewater, which cannot be removed from the wastewater in the desired amount by physical or chemical methods, using microorganisms. The trickling filter, activated sludge, stabilization tank (oxidation tank) are the main biological treatment units.

- Advanced Treatment: This is a treatment method for the removal of pollutants (nitrogen, phosphorus, heavy metals, toxic organic substances, etc.) that cannot be treated adequately or at all by physical or biological treatment methods. Nitrification, denitrification, adsorption, ion exchange, etc. are the main methods of advanced treatment.

- Natural Treatment: This is the process of sedimentation of pollutants in artificial wetlands and treatment of 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 main amount of municipal waste is waste produced by households. It also includes waste produced by commercial and industrial establishments, office buildings, institutions and small workplaces.

Landfilling of Wastes

Landfills are those areas where waste is temporarily stored for recovery, pretreatment, or disposal within the facility where the waste is generated, facilities where waste is stored for recovery or pretreatment for less than 3 years, and interim waste disposal facilities for no more than one year.

Except for the facilities where the waste is stored, these are the sites where the waste is disposed of under certain technical standards. This indicator contains information on the number of waste landfill facilities and the percentage of the population served.

Medical Waste

This is the total amount of infectious, pathological, and penetrating waste reported to the waste declaration system by Medical Waste Producers (waste producers).

Waste Oils

It indicates the amount obtained from the declarations made to the Waste Declaration System by the waste producers of the mineral oils that are not fit for their original use and whose waste codes are listed in Annex-1 of the By-Law on Waste Oil.

Waste Vegetable Oils

It is the amount of waste vegetable oils evaluated under the code "20 01 25 - Edible oils and fats" and used frying oils evaluated under the code "20 01 26* - Oils and fats other than 20 01 25 (A)" of the list of wastes in Annex 4 of By-Law on Waste Management, published in the Official Gazette of 02.04.2015 under the number 29314, declared by waste producers in the waste declaration system.

Waste Batteries and Accumulators

It shows the total amount of waste batteries and accumulators resulting from the declarations made by the waste producers to the Waste Declaration System.

End of Life Tires

This is the quantity resulting from the declarations made by the end-of-life tire manufacturers (waste producers) to the waste declaration system.

End of Life Vehicles

It is the number of deregistration and disposal forms issued for vehicles of class M1 (motor vehicles with no more than eight seats except the driver, intended for passenger transport), N1 (motorized cargo transport vehicles with a maximum mass not exceeding 3500 kg) according to the "By-Law on the Control of End-of- Life Vehicles" and for three-wheeled vehicles other than motorcycles and mopeds.

Waste Electrical and Electronic Equipment

It refers to the amount of waste electrical and electronic equipment (WEEE) reported by waste producers to the Waste Declaration System

Packaging Waste

It provides information on the quantity and recycling of waste sales, repackaging and shipping packaging, including expired reusable packaging used for the presentation of the product during the process of transferring the products or any material to the consumer or end user. This includes the end-of-life reusable packaging but excludes production waste that is disposed of or left in the environment.

Business firm (for packaging waste)

This includes packaging manufacturers, distributors and suppliers.

Mining Waste

This is the waste identified from the results of the survey in all mining establishments in the sector of hard coal and lignite extraction, metal ore mining, mining and other activities supporting the quarrying sector, and in all mining establishments with 10 or more employees in the other mining and quarrying sector.

Hazardous Wastes

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

Ship Generated Wastes

Ship generated wastes refer to wastes generated during the normal operation of a ship and falling within the scope of MARPOL 73/78 Annex-I (petroleum and petroleum derived wastes), Annex-2 (toxic liquid wastes), Annex- IV (sewage) and Annex-V (garbage).

Recovery

It is the conversion of waste into a similar substance or a new raw material, product or energy by going through certain processes. For example, obtaining nylon fibers from plastic bottles, converting waste paper back into paper, obtaining energy by using waste as fuel in incinerators, producing compost or biogas from organic waste, etc.

LAND USE

Distribution of General Land Cover

According to the CORINE project (Coordination of Information on the Environment), land use types are divided into two.

1-Land Cover: It refers to the condition of the land covered with biological or physical elements such as natural maquis shrublands, natural cliffs, natural pastures, etc.

2- Land Use: It refers to the land use caused by human impact.

This indicator shows a comparison between the land use changes and the proportional indication of the land use types identified according to the Coordination of Information on the Environment-CORINE project.

The land use categories identified according to CORINE are:

1. Artificial Zones: Most of these areas are covered with buildings and a transportation network.

2. Agricultural Areas: Both cultivated agricultural areas and pasture areas fall under this heading.

3. Forest and Semi-Natural Areas: These are the areas consisting of forests, maquis, herbaceous plants and un-planted and less planted open areas.

4. Wetlands: These areas consist of all water bodies, swamps, reedbeds and turbines, which are important as habitats for living organisms, especially waterfowl, and which have a depth of not more than six meters during the retreat phase of tidal movements of natural or artificial, continuous or temporary, with calm or flowing, sweet, bitter or salty seas, and the ecologically wetlands from the coastline to the land side of these areas.

5. Water Bodies: This includes the water bodies such as continental waters (stream areas) and marine waters (lagoons, bays, sea and oceans).

Misuse of Agricultural Land

It refers to allowing the lands that have the characteristic of agricultural land to be taken out of agriculture for the purpose of using it with laws or by-laws.

Zone at Risk of Erosion

Erosion is the transport of soil from its natural environment by effects such as water flow, wind, and gravity. Although erosion is a natural occurrence, it is exacerbated by effects such as water flow, wind, and gravity as a result of degradation of the natural structure of the soil. Although different types of erosion can be observed in almost all soils in the country, the most common is water erosion. This indicator shows the erosion phenomena occurring in agriculture, forests and grasslands along with their severity.

BIODIVERSITY

Biodiversity

Biodiversity is the set of genes, species, ecosystems and ecological events in a given region. In other words, biodiversity includes all the genes in a given region, the species that carry those genes, the ecosystems that host those species, and the events (processes) that link them.

Protected Areas

According to the definition updated in 2008 by the International Union for Conservation of Nature (IUCN) in 2008, protected areas are areas with clearly defined geographical boundaries that serve the long-term conservation of nature and associated ecosystem services and cultural values and are recognized, dedicated and managed through legal or other effective methods.

Forest Area

It is the size of the area covered by forest in a given closed area in terms of measurement hectares.

Normal Closed Forest (Productive)

These are forests where the canopies of the trees cover 11-100% of the area.

Degraded Forest

These are forests where less than 10% of the tree canopy covers the area.

Growing Stock

The sum of the cylindrical body volumes in m3 of the standing tree trunks with a breast diameter of 8 cm or more.

Definitions Related to Forestry Studies;

Functional Forestry

This indicator refers to the areas reserved in the total forest area according to forest products production, nature conservation, erosion prevention, hydrological, aesthetic, ecotourism and recreation, climate protection, public health, national defense and scientific use purposes.

Growing Stock

The sum of the cylindrical body volumes in m3 of the standing tree trunks with a breast diameter of 8 cm or more.

Pasture improvement

It includes measures such as irrigation, fertilization, weeding, seeding, planting, sapling planting and similar biological techniques to increase the forage yield of meadows and pastures in quality and quantity, construction of plants that facilitate grazing, implementation of various physical, technical and administrative measures for soil conservation.

Rehabilitation

This refers to efforts that include protection, inoculation, revitalization pruning of existing species in degraded or unproductive forest areas, cultivation of species that grow naturally in forests in vacant areas, and planting of grafted or non-grafted seedlings of these species.

Erosion Control

This includes efforts to take measures against erosion and transport of soil on the earth subsoil due to various factors.

Artificial Tensile

This includes the work of tillage, weed removal and wire encircling with machinery and labor.

Private Afforestation

It is the afforestation carried out in accordance with the project approved by the Ministry of Agriculture and Forestry by village legal entities, municipalities, associations, foundations, chambers, legal entities

and real persons in degraded forest areas, treasure lands and own lands, the timber and fruits of which belong to the respective person.

INFRASTRUCTURE AND TRANSPORT

Road and Railway Road Network

It refers to the total road (highways, state roads, provincial roads) and railway expansion and length.

Amount of Freight and Passengers Transported by Mode of Transport

This indicator shows the percentage distribution among transport modes within the country for freight and passengers.

Number of Motor Vehicles

It indicates the total number of road motor vehicles such as automobiles (including off-road vehicles), minibuses, buses, pickup trucks, trucks, and motorcycles, special purposed vehicles, road and work machinery and tractors.

ENERGY

Energy Consumption

This is the amount of energy resources that businesses consume as final energy, energy conversion and non-energy.

Total Energy Consumption by Sectors

This indicator shows the total energy consumption for residential, industrial, transportation, agriculture, non-energy, petroleum equivalent conversion sectors.

Gross Domestic Energy Consumption

It represents the amount of energy needed to meet a country's domestic consumption. Gross domestic energy consumption is calculated as primary production + recovered products + total imports - stock fluctuations - total exports - bunker formulation.

Primary Energy Consumption

Primary energy consumption is the value obtained by subtracting non-energy use of energy from gross domestic energy consumption.

Final energy consumption

It is the amount of final energy used by enterprises for the production of goods and services, space heating and transport purposes. This indicator expresses the total energy available to final consumers for all energy sources. It corresponds to the total final energy consumption in the 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 transformation sector. The amount of fuel converted in industrial automotive power plants and the amount of coke converted to blast furnace gas are part of the transformation sector, not industrial consumption. The amount of final energy consumed in the transportation sector includes all modes of transportation such as rail,

road, airlines, and national maritime. Consumption figures in the household and service sectors are aggregated.

Primary Energy Production

It expresses the amount of energy produced from solid fuels such as coal and wood, petroleum, gas and renewable sources and the ratio of each resource to the total amount of energy produced.

Share of Renewable Energy Resources in Consumption

This indicator shows the share of energy produced from renewable energy sources (wood, animal and plant residues, hydraulic, geothermal, wind and solar) in total consumption. Renewable energy sources refer to energy provided from existing external environmental energy flows or materials derived from them.

Primary and Final Energy Intensity

The intensity calculated as a result of the ratio of primary energy consumption to GDP, and the intensity calculated as a result of the ratio of final energy consumption to GDP is called final energy intensity.

Energy Consumption in Conversion Processes

It is the amount of energy consumed by enterprises in electricity production, heat generation, coking/ blast furnaces.

Non-Energy Consumption

It is the amount of energy consumed when companies use an energy source as a raw material, etc., rather than for energy purposes.

INDUSTRY AND MINING

Environmental Impact Assessment (EIA)

It includes the efforts to identify the positive and negative impacts of the proposed projects on the environment, the definition and evaluation of the measures to avoid the negative impacts or minimize the environmental damage, the choice of the site and technological alternatives, and the monitoring and control of the implementation of the projects.

EIA Positive

It is the decision of the Ministry stating that the negative impact of the project on the environment is at an acceptable level in accordance with the relevant legislation and scientific principles as a result of the measures to be taken, taking into account the assessments made by the Commission for Scope Determination and Evaluation/Assessment about Environmental Impact Assessment Report.

EIA Negative

The decision of the Ministry stating that the implementation of the project is inappropriate due to the negative impact on the environment, taking into account the assessments made by the Commission for Scope Determination and Evaluation/Assessment.

AGRICULTURE

Agricultural Land Per Capita

It is defined as the ratio of total arable agricultural area to the total population.

Chemical Fertilizer Consumption

The amount of active substance (ton / year) in the amount of artificial fertilizers consumed in agriculture gives the amount of nitrogen, phosphorus, Nitrogen-Phosphorus-Calcium mixed.

Use of Pesticides

It refers to the total annual use of pesticides.

Organic Farming

Organic farming is a controlled and certified form of agricultural production that avoids the use of chemical agents in production at every stage from production to consumption, using instead those allowed by By-Law. This indicator expresses the amount and area of agricultural products produced using organic farming methods.

Good Agricultural Practices

According to By-Law, published in Official Gazette of 7 December 2010 and numbered 27778, good agricultural practices refer to the procedures that should be followed in order to make the agricultural production system socially viable, economically profitable and efficient, while protecting human health and giving importance to animal health and welfare and the environment.

FISHERIES

Aquaculture Production

It expresses the amount of fish produced, including marine fish, shellfish, molluscs, freshwater and aquaculture products caught in our inland waters each year. Production data is expressed in live weight, which is the weight of the resource at the time of catch or production.

Fishing Fleet Capacity

It expresses the expression of the total fishing vessels in terms of engine power.

TOURISM

Number of Tourists

The number of tourists is the figure obtained by subtracting the number of daily tourists from the total number of foreign visitors coming to Turkey and the number of citizens living abroad.

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 Turkey since 1994. This is the indication of the total number of beaches, marinas and yachts over the years, with the inclusion of yachts since 2008.

DISASTERS

Forest Fires

This indicator is the expression of total forest area burned in total forest area by year.

Disasters by Types

This indicator expresses the number of periodic hydrological (flood, landslide), meteorological (storm, avalanche), geophysical (earthquake, volcanic activity) and climatic (temperature anomalies, drought, fire) natural disasters and industrial accidents, traffic accidents, pipeline transports, as well as the loss of life and property caused by them.

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