# TURKEY

This country profile is part of the **Climate Transparency Report 2020**. Find the full report and other G20 country profiles at: www.climate-transparency.org

## PER CAPITA GREENHOUSE GAS (GHG) EMISSIONS BELOW G20 AVERAGE

Turkey's greenhouse gas (GHG) emissions are – per capita – below the G20 average, but are rising. Total GHG emissions (excl. land use) have more than doubled since 1990.
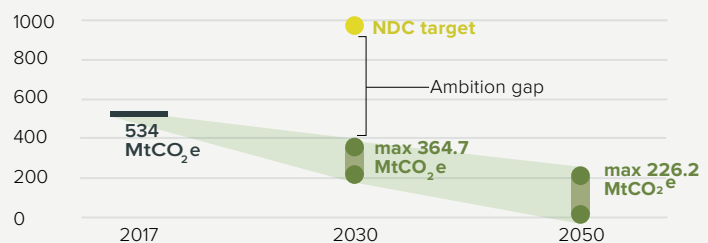
*Data for 2017. Source: Enerdata, 2020, UN Department of Economic and Social Affairs Population Division, 2020 and Gütschow et al., 2019*

### GHG emissions (incl. land use) per capita (tCO$_2$e/capita)[1]

**5.35** Turkey

**7.32** G20 average

### 5-year trend (2012-2017)

**+5.6%** Turkey

**-2.3%** G20 average

## NOT ON TRACK FOR A 1.5°C WORLD

**1.5°C**

Turkey would need to reduce its emissions to below 365 MtCO$_2$e by 2030 and to below 226 MtCO$_2$e by 2050 to be within its emissions allowances under a 'fair-share' range compatible with global 1.5°C. Turkey's intended 2030 national emissions reduction target is to reduce emissions 21% below what it calls a business-as-usual scenario, equivalent to 999 MtCO$_2$e, by 2030; however, with current policies, its emissions are projected to be between 730-884 MtCO$_2$e in 2030. All figures exclude land use emissions and are based on pre-COVID-19 projections.

### Turkey 1.5°C 'fair-share' pathway (MtCO$_2$e/year)[1,2]



- NDC target
- Ambition gap
- 534 MtCO$_2$e (2017)
- max 364.7 MtCO$_2$e (2030)
- max 226.2 MtCO$_2$e (2050)

*Source: Climate Action Tracker, 2020*

## KEY OPPORTUNITIES FOR ENHANCING CLIMATE AMBITION

**TARGET DEEPER EMISSIONS REDUCTIONS**

**Recent analysis has shown that Turkey could achieve a 14% overall reduction in GHG emissions below 2017 levels by 2030 with ambitious but realistic measures in** the electricity, buildings, and transport sectors alone.

**SET A MORE AMBITIOUS TARGET NOW**

Turkey has still not ratified the Paris Agreement, and with emissions since the submission of its intended 2030 target consistently well below government projections, **there is a strong argument for ratifying the agreement with a more ambitious target.**

**INDEPENDENT RENEWABLE ENERGY**

With rapidly falling costs for wind and solar energy, Turkey's intention to increase domestic coal consumption to secure **its energy independence could be achieved through renewable energy** instead, with additional public health co-benefits.

*References: Climate Action Tracker, 2020; Turkish Statistical Institute, 2020; IRENA, 2020*

## RECENT DEVELOPMENTS

As of July 2020, Turkey had 32 GW of new coal power capacity planned. (The only country in the world with more than what Turkey has in the pipeline is China.) However, given the limited demand growth in recent years and that financing new coal projects is becoming increasingly difficult, **some of this capacity may not eventuate**.

In Turkey's latest Energy Strategy 2019-2023, released in 2019, **total targeted renewable energy capacity has fallen** from the previous 2023 target of 61 GW to 57 GW.

The increased 2023 target for the share of renewable energy generation in the power mix of 39%, set in 2019, has already been surpassed, with it reaching 44% in 2019. This milestone was primarily achieved, however, due to low overall demand rather than recent additions to the grid, with **solar and wind generation prioritised due to its low cost**.

*References: Global Energy Monitor, 2020; Republic of Turkey Ministry of Energy and Natural Resources, 2019; Government of Turkey, 2019*

## ⚙ CORONAVIRUS RECOVERY

The Turkish government has not committed to a green recovery from the COVID-19 crisis. Despite the IEA's projection that 9 million new energy-related jobs could be created worldwide between 2021-2023 by investing in a sustainable recovery plan, Turkey's stated commitment to maintaining employment does not include any explicit measures to ensure a sustainable recovery. Rather, a focus has been placed on reviving export and production-oriented growth.

*Reference: IEA, 2020*

## CONTENTS

We unpack Turkey's progress and highlight key opportunities to enhance climate action across:

**ADAPTATION** Page 3

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**Reducing emissions from**
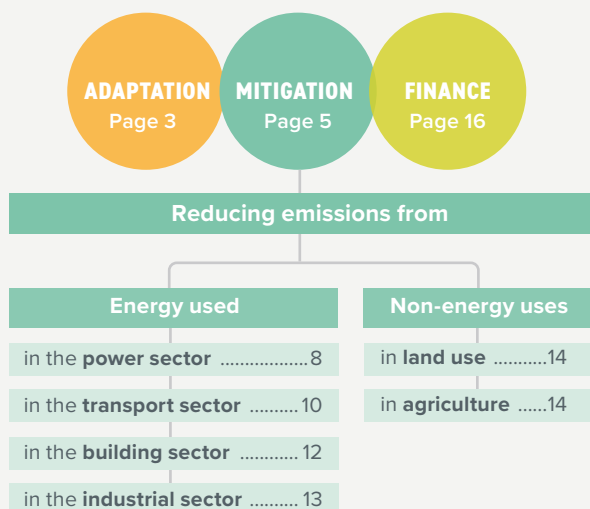
## LEGEND

**Trends** show developments over the past five years for which data are available. The thumbs indicate assessment from a climate protection perspective.

**Decarbonisation Ratings**[4] assess a country's performance compared to other G20 countries. A high score reflects a relatively good effort from a climate protection perspective but is not necessarily 1.5°C compatible.

Very low    Low    Medium    High    Very high

**Policy Ratings**[5] evaluate a selection of policies that are essential pre-conditions for the longer-term transformation required to meet the 1.5°C limit.

Low    Medium    High    Frontrunner

## SOCIO-ECONOMIC CONTEXT

### Human Development Index

"The Human Development Index reflects life expectancy, level of education, and per capita income. Turkey ranks very high."
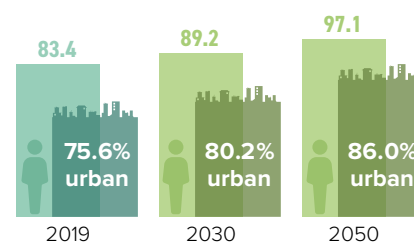
Very high
High
Medium
Low

**VERY HIGH 0.8**
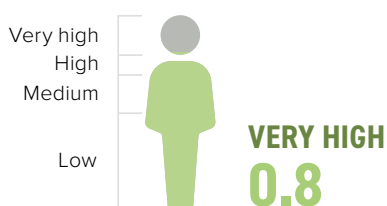
*Data for 2019. Source: UNDP, 2019*

### Population and urbanisation projections

**(in millions)**

Turkey's population is expected to increase by about 16% by 2050, and become more urbanised.

83.4 — 75.6% urban — 2019
89.2 — 80.2% urban — 2030
97.1 — 86.0% urban — 2050

*Sources: The World Bank, 2019; United Nations, 2018*

### Gross Domestic Product (GDP) per capita

**(PPP constant 2015 international $)**

**30,082 TURKEY**

**22,230 G20 AVERAGE**

*Data for 2019. Source: The World Bank, 2020*

### Death rate attributable to air pollution

**Ambient air pollution attributable death rate per 1,000 population per year, age standardised**

**0.5** TURKEY

**0.1–1.1** G20 RANGE

Over 36,000 people die in Turkey every year as a result of outdoor air pollution, due to stroke, heart disease, lung cancer and chronic respiratory diseases. Compared to total population, this is one of the higher levels in the G20.

**36,698 deaths per year**

*Data for 2016. Source: WHO, 2018*

## JUST TRANSITION

**SOCIAL ISSUES NEED TO BE CONSIDERED**

Turkey is explicitly targeting an increased share of power generation from domestic coal, aiming to increase domestic production by 248% between 2019 and 2023, and increasing installed capacity using domestic coal by 4 GW over the same period. This stands in contradiction to the intent behind its Decent Work in the Green Economy initiative which promotes Turkey's transition to a greener economy, as well as the admission in Turkey's 2015-2018 Industry Strategy Plan that "green jobs" are likely to become an engine of growth. The subsequent 2019-2023 Industry and Technology Strategy had no such focus, instead pivoting towards an emphasis on technology and encouraging the creation of new tech startups, while reiterating an intention to boost manufacturing and exports. Government policy is lagging the impressive gains in renewable energy installations, as the amended 2023 target for the share of renewable generation in the power mix (38.8%) was surpassed in the same year as it was updated (2019). The energy transition in Turkey has been framed solely as an engineering problem with technological solutions, while no public debates have addressed spatial and social considerations, energy equity, or energy justice.

*References: Republic of Turkey Ministry of Energy and Natural Resources, 2019; Enerdata 2020*

# 1. ADAPTATION
## ADDRESSING AND REDUCING VULNERABILITY TO CLIMATE CHANGE

**PARIS AGREEMENT**  **Increase the ability to adapt to the adverse effects of climate change and foster climate resilience and low-GHG development.**

**VULNERABLE TO CLIMATE CHANGE**
Turkey is vulnerable to climate change and adaptation actions are needed.

**SEVERE IMPACTS ON AGRICULTURE SECTOR**
With global warming, society and its supporting sectors are increasingly exposed to severe impacts such as droughts and reduction in crop duration in the agricultural sector.

**RISING TEMPERATURE CONCERN**
With 3°C of warming, Turkey would experience around 35 days per year when temperatures reach more than 35°C.
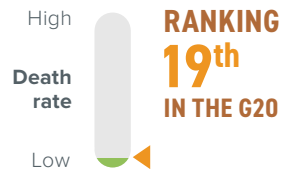
## ADAPTATION NEEDS

### Climate Risk Index

All numbers are averages (1999-2018).

**Annual weather-related fatalities**

27 DEATHS

0.04 PER 100,000 INHABITANTS

Death rate — High / Low

**RANKING 19th IN THE G20**

*Source: Based on Germanwatch, 2019*

**Annual average losses (USD mn PPP)**

$343

0.03 PER UNIT GDP (%)

Losses — High / Low

**RANKING 18th IN THE G20**

*Source: Based on Germanwatch, 2019*

## Exposure to future impacts at 1.5°C, 2°C and 3°C

Impact ranking scale:
⚪ Very low   🟡 Low   🟠 Medium   🟠 High   🟤 Very high

| | | | 1.5°C | 2°C | 3°C |
|---|---|---|---|---|---|
| **WATER** | | % of area with increase in water scarcity | Low | Low | Medium |
| | | % of time in drought conditions | High | Very high | Very high |
| **HEAT AND HEALTH** | | Heatwave frequency | Low | High | Very high |
| | | Days above 35°C | Medium | Medium | High |
| **AGRICULTURE** | **Maize** | Reduction in crop duration | Low | High | Very high |
| | | Hot spell frequency | High | High | High |
| | | Reduction in rainfall | Medium | Low | Very low |
| | **Wheat** | Reduction in crop duration | Low | High | Very high |
| | | Hot spell frequency | High | High | High |
| | | Reduction in rainfall | Very high | Very high | Very high |

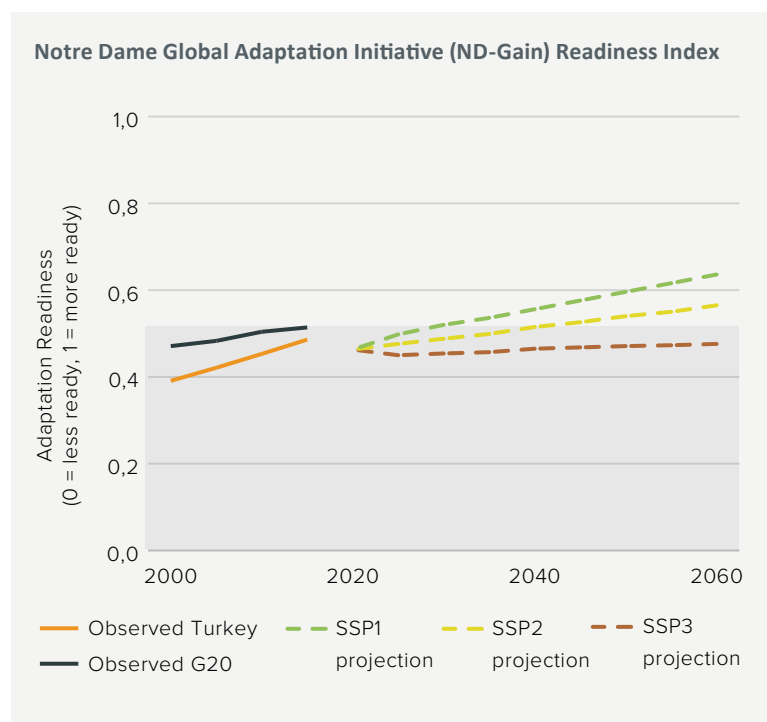*Source: Water, Heat and Health: own research. Agriculture: Arnell et al., 2019*

*Note: These indicators are national scale results, weighted by area and based on global data sets. They are designed to allow comparison between regions and countries and, therefore, entail simplifications. They do not reflect local impacts within the country. Please see technical note for further information.*

**☀ CORONAVIRUS RECOVERY**  Turkey has not addressed the need to invest in climate adaptation with its announced responses to the COVID-19 crisis.

## Adaptation readiness

The figure shows 2000-2015 observed data from the ND-GAIN Index overlaid with projected Shared Socioeconomic Pathways (SSPs) from 2015-2060.



**Notre Dame Global Adaptation Initiative (ND-Gain) Readiness Index**

Legend:
— Observed Turkey
— Observed G20
-- SSP1 projection
-- SSP2 projection
-- SSP3 projection

**Turkey scores below the G20 average in observed data, though its readiness has been improving steadily. Adaptation challenges still exist, but Turkey is well positioned to adapt if it puts in place measures compatible with SSP1. Measures represented by SSP3 would likely undermine its readiness to adapt in the long term.**

*The readiness component of the Index created by the Notre Dame Global Adaptation Initiative (ND-GAIN) encompasses social economic and governance indicators to assess a country's readiness to deploy private and public investments in aid of adaptation. The index ranges from 0 (low readiness) to 1 (high readiness).*

*The overlaid SSPs are qualitative and quantitative representations of a range of possible futures. The three scenarios shown here in dotted lines are qualitatively described as a sustainable development-compatible scenario (SSP1), a middle-of-the-road (SSP2) and a 'Regional Rivalry' (SSP3) scenario. The shaded area delineates the G20 average in 2015 for easy reference.*

*Source: Andrijevic et al., 2020*

# ADAPTATION POLICIES

## National Adaptation Strategies

| Document name | Publication year | Fields of action (sectors) | | | | | | | | | | | | | M&E process |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Agriculture | Biodiversity | Coastal areas and fishing | Education and research | Energy and industry | Finance and insurance | Forestry | Health | Infrastructure | Tourism | Transport | Urbanism | Water | |
| Turkey's National Climate Strategy and Action Plan | 2012 | ● | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | n/a |

## Intended Nationally Determined Contribution (NDC): Adaptation

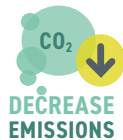| Targets | Actions |
|---|---|
| Not mentioned | Not mentioned |

# 2. MITIGATION
## REDUCING EMISSIONS TO LIMIT GLOBAL TEMPERATURE INCREASE

**PARIS AGREEMENT** **Hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit to 1.5°C, recognising that this would significantly reduce the risks and impacts of climate change.**

## EMISSIONS OVERVIEW

**CO₂ DECREASE EMISSIONS**

Turkey's GHG emissions have increased by 134% (1990-2017) and the government's proposed climate targets for 2030 (-21% below its business-as-usual scenario) is **not in line with a 1.5°C pathway.** Projections under current policies show 2030 emissions will be below the government's modest target.

**1.5°C COMPATIBILITY**

In 2030, global $CO_2$ emissions need to be 45% below 2010 levels and reach net-zero by 2050. **Global energy-related $CO_2$ emissions must be cut by 40%** below 2010 levels by 2030 and reach net-zero by 2060.

*Source: Rogelj et al., 2018*

## GHG emissions across sectors and CAT 1.5°C 'fair-share' range (MtCO₂e/year)

**Total GHG emissions across sectors (MtCO₂e/year)**



534 MtCO₂e

Legend:
- Energy
- Industrial processes
- Agriculture
- Waste
- Other
- Historical emissions/removals from land use
- NDC target
- Total emissions (excl. land use), historic and projected
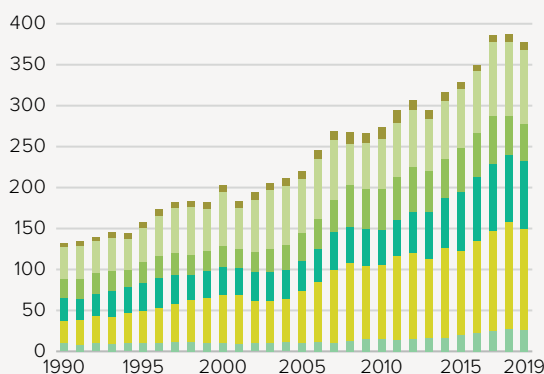- 1.5°C 'Fair-share' range
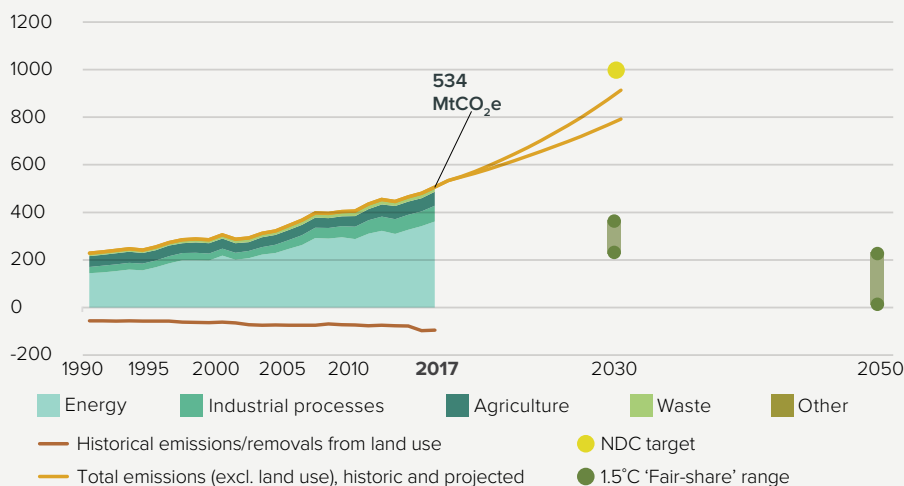
**Turkey's emissions (excl. land use) have more than doubled between 1990 and 2017 (+134%) and are projected to continue to grow until at least 2030.** Turkey is on track to overachieve its INDC based on current policies, indicating significant potential for the government to scale up climate action, ratify the Paris Agreement, and submit a stronger NDC. **Emissions will need to be substantially lower than current levels in 2030 in order for Turkey to become 1.5°C compatible.**
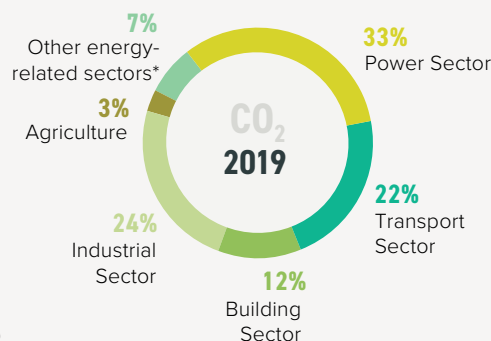
*Sources: Gütschow et al., 2019; Climate Action Tracker, 2020*

## Energy-related CO₂ emissions by sector

**Annual CO₂ emissions from fuel combustion (MtCO₂/year)**



CO₂ 2019
- 7% Other energy-related sectors*
- 3% Agriculture
- 24% Industrial Sector
- 12% Building Sector
- 22% Transport Sector
- 33% Power Sector

The largest driver of overall GHG emissions are $CO_2$ emissions from fuel combustion. In Turkey, **overall GHG emissions** have fallen in 2019 from an all-time high in 2018, mainly due to a drop in electricity sector emissions. The electricity sector, at 33%, is still the largest contributor, followed by industry and transport, at 24% and 22%, respectively.

*Source: Enerdata, 2020*

* 'Other energy-related sectors' covers energy-related $CO_2$ emissions from extracting and processing fossil fuels. Due to rounding, some graphs may sum to slightly above or below 100%.

**⚙ CORONAVIRUS RECOVERY** While the vast majority of the measures announced by the Turkish government in response to the COVID-19 crisis are not explicitly aimed at furthering action on climate change, there are some that do have implications for GHG emissions. The VAT on domestic airline travel has been reduced from 18% to 1%, which will ensure higher aviation emissions than otherwise, while flexible and remote working models regulated under Turkish legislation will be encouraged, which will likely reduce emissions from other forms of transport.

*Reference: Lexology, 2020*

# ENERGY OVERVIEW

**82%**
OF TURKEY'S ENERGY MIX IS FOSSIL FUELS

**Fossil fuels still make up 82% of Turkey's energy** mix (counting power, heat, transport fuels, etc). Total demand for fossil fuels has been falling since 2017, led primarily by **a fall in natural gas consumption.** However, overall energy demand has remained constant over this time due to **increasing generation from renewables.**
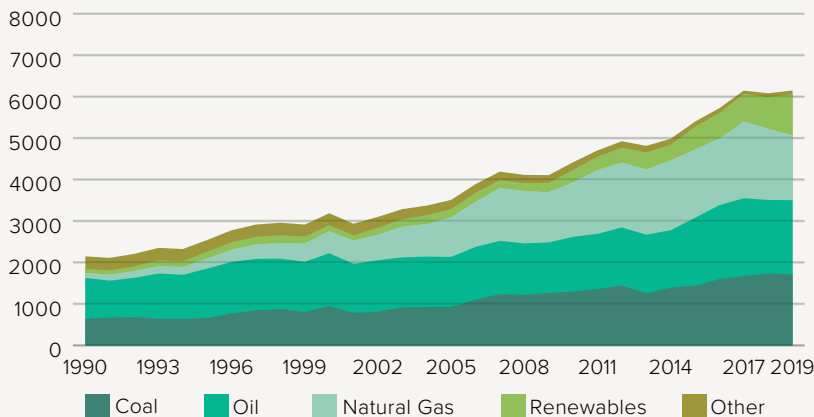
**1.5°C**
COMPATIBILITY
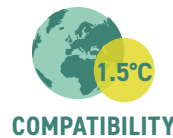
In 2030, global CO$_2$ emissions need to be 45% below 2010 levels and reach net-zero by 2070.

*Source: Rogelj et al., 2018*

## Energy Mix

**Total primary energy supply (PJ)**



**16%** Low carbon

**16%** Renewables

**1%** Other

**28%** Coal

**29%** Oil

**82%** Fossil fuels

2019

**25%** Natural gas

Coal  Oil  Natural Gas  Renewables  Other

*Source: Enerdata, 2020*

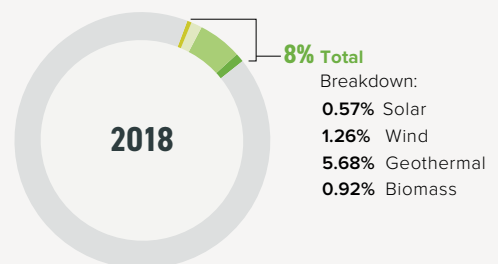*Due to rounding, some graphs may sum to slightly above or below 100%.*
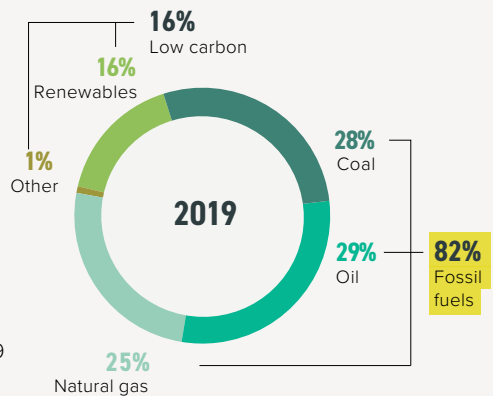
This graph shows the fuel mix for all energy supply, including energy used not only for electricity generation, heating, cooking, but also for transport fuels. Fossil fuels (oil, coal and gas) still make up 82% of Turkey's energy mix, meaning Turkey is now in line with the G20 average (82%). While the share of renewables in the energy mix increased, mainly replacing natural gas.

## Solar, Wind, Geothermal, and Biomass Development

**Total primary energy supply (TPES) from solar, wind, geothermal and biomass (PJ)**
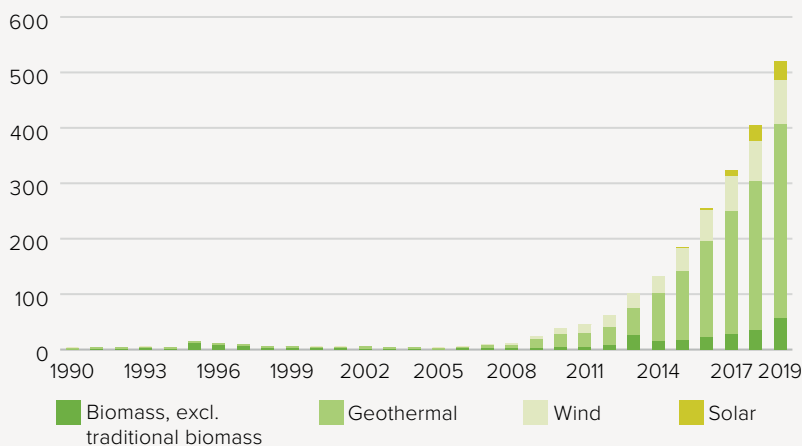


**Solar, wind, geothermal and biomass account for 8% of Turkey's energy supply**

**8%** Total
Breakdown:
**0.57%** Solar
**1.26%** Wind
**5.68%** Geothermal
**0.92%** Biomass

2018

Biomass, excl. traditional biomass  Geothermal  Wind  Solar

*Source: Enerdata, 2020*

*Large hydropower and solid fuel biomass in residential use are not reflected due to their negative environmental and social impacts.*
*Due to rounding, some graphs may sum to slightly above or below 100%.*

**Decarbonisation rating: RE share of TPES compared to other G20 countries**

5-year trend (2014-2019):  **Very high**

Current year (2019):  **High**

*Source: own evaluation*

**Solar, wind, geothermal and biomass account for 8% of Turkey's energy supply – the G20 average is only 6%.** The share in total energy supply has increased by around 213% in the last five years in Turkey (2014-2019), with **over a 25% year-on-year increase** in 2019. Geothermal makes up the largest share by far, but wind and solar are also growing rapidly.
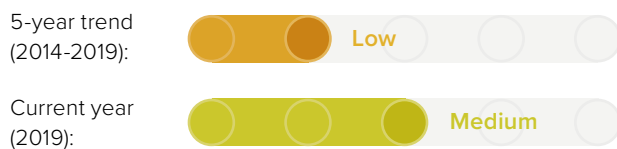
## Carbon Intensity of the Energy Sector

Tonnes of $CO_2$ per unit of total primary energy supply (t$CO_2$/TJ)



61.22
t$CO_2$/TJ

Turkey — G20 Average
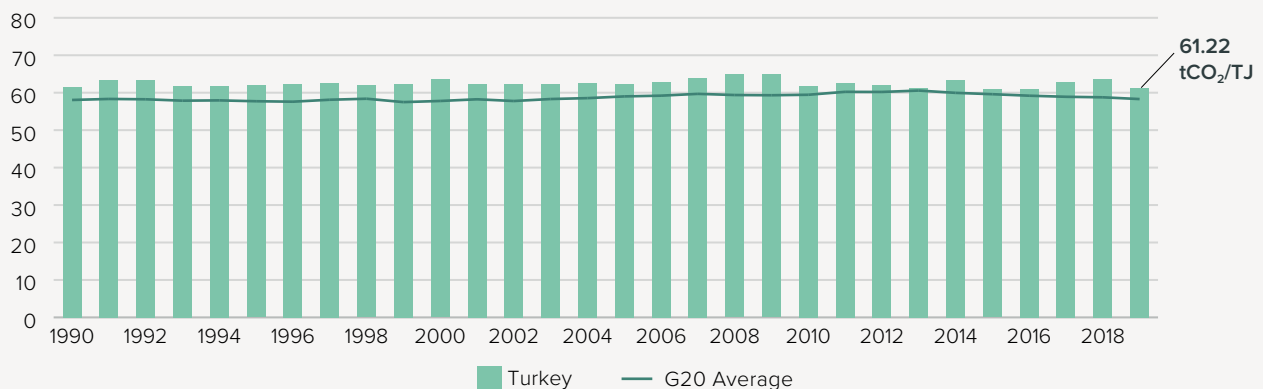
*Source: Enerdata, 2020*

**Decarbonisation rating: carbon intensity of the energy sector compared to other G20 countries**
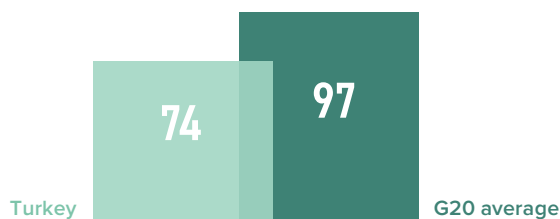
5-year trend
(2014-2019):      Low

Current year
(2019):      Medium

Carbon intensity shows how much $CO_2$ is emitted per unit of energy supply. In Turkey, carbon intensity has remained almost constant at around 61 t$CO_2$ over the last five years and is slightly higher than the G20 average. This relatively high level reflects the continuously high share of fossil fuels in the energy mix.

*Source: Enerdata, 2020*

## Energy supply per capita

**(GJ/capita)**



74
Turkey

97
G20 average

*Source: Enerdata, 2020; The World Bank, 2019b*

**TPES per capita (GJ/capita): 5-year trend (2014-2019)**

👎 **+14.4%**
Turkey

👎 **+1.9%**
G20 average

The level of energy use per capita is closely related to economic development, climatic conditions and the price of energy.

Energy use per capita in Turkey is 74 GJ/capita, below the G20 average, but is increasing rapidly (+15%, 2014-2019) compared to the G20 average (+2%).
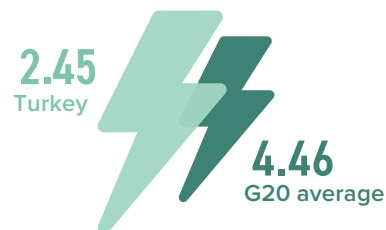
**Decarbonisation rating: energy supply per capita compared to other G20 countries**

5-year trend
(2014-2019):      Very low

Current year
(2019):      High

*Source: own evaluation*

## Energy intensity of the economy

**(TJ/PPP USD2015 millions)**



2.45
Turkey

4.46
G20 average

*Data for 2018. Source: Enerdata, 2020*

**Energy intensity of the economy: 5-year trend (2014-2019)**

👎 **+1.9%**
Turkey

👍 **-11.6%**
G20 average

This indicator quantifies how much energy is used for each unit of GDP, which is closely related to the level of industrialisation, efficiency, climatic conditions and geography.

Turkey's energy intensity is **one of the lowest in the G20 but is increasing (+2%, 2013-2018)**, while the G20 is decreasing rapidly (-12%, 2013-2018).

**Decarbonisation rating: energy intensity compared to other G20 countries**

5-year trend
(2013-2018):      Very low

Current year
(2018):      Very high

*Source: own evaluation*

# POWER SECTOR

## Emissions from energy used to make electricity and heat

**While renewable energy generation has been increasing in recent years, in 2019 Turkey still produced 37% of its electricity from coal. Due to concerns about reliance on foreign energy imports, Turkey has committed to increase its renewable energy generation and consumption of domestically produced coal, mostly at the expense of natural gas.** ==If Turkey implements this, emissions reductions from an increasing share of generation from renewables will be largely cancelled out by the substitution of gas with more polluting coal-fired power.==
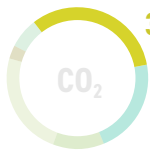
**33%** Share in energy-related $CO_2$ emissions from electricity and heat production

*Source: Enerdata, 2020*

**1.5°C**
**COMPATIBILITY**
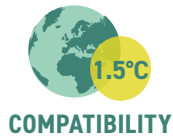
**Coal and decarbonisation**

Worldwide, **coal use for power generation needs to peak by 2020**, and between 2030 and 2040, all the regions of the world need to phase out coal-fired power generation. **Electricity generation has to be decarbonised before 2050**, with renewable energy the most promising alternative.
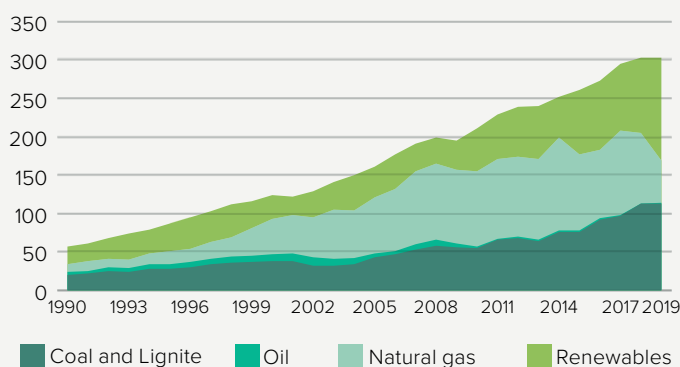
*Sources: Rogelj et al., 2018; Climate Analytics, 2016; Climate Analytics, 2019*

# STATUS OF DECARBONISATION
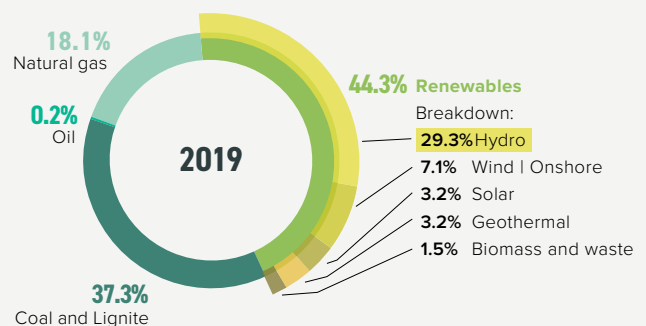
## Electricity mix



**Gross power generation (TWh)**

Coal and Lignite · Oil · Natural gas · Renewables

**2019**

18.1% Natural gas
0.2% Oil
37.3% Coal and Lignite
44.3% Renewables
Breakdown:
29.3% Hydro
7.1% Wind | Onshore
3.2% Solar
3.2% Geothermal
1.5% Biomass and waste

*Source: Enerdata, 2020*

*Due to rounding, some graphs may sum to slightly above or below 100%.*

Turkey is producing an increasing share of its power from renewables, accounting for almost half of the power mix (the G20 average is 27%). Hydropower makes up roughly two thirds of this renewable generation, but wind and solar are increasing rapidly. Coal generation remains over a third of the power mix, and with a very large pipeline of additional capacity set to come online over the medium term, will remain a large share of the power mix without drastic policy intervention from the government.

## Share of renewables in power generation

**(incl. large hydro)**

**44%** Turkey
**27%** G20 average
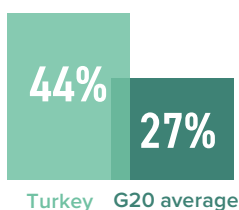
*Source: Enerdata, 2020*

**Decarbonisation rating: share of renewables compared to other G20 countries**

5-year trend (2014-2019): **High**

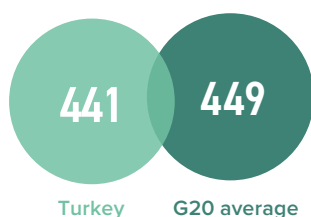Current year (2019): **High**

*Source: own evaluation*

**Share of renewables in power generation: 5-year trend (2014-2019)**

👍 **+77%** Turkey

👍 **+19.5%** G20 average

## Emissions intensity of the power sector
**Country vs G20 average (gCO$_2$/kWh)**

441 — Turkey
449 — G20 average

*Source: Enerdata 2020*

**Emissions intensity: 5-year trend (2014-2019)**

👍 **-3.1%** Turkey | 👍 **-10.4%** G20 average

For each kilowatt hour of electricity generated, 441 gCO$_2$ are emitted in Turkey. This is roughly in line with the G20 average. The overall emissions intensity has dropped marginally over the last five years (-3.1%, 2014-2019), primarily due to the large year-on-year increase in renewables generation in 2019 at the expense of natural gas. Prior to that, fossil-fuel-based generation was increasing considerably.

**Decarbonisation rating: emissions intensity compared to other G20 countries**

5-year trend (2014-2019): **Low**

Current year (2019): **Medium**

*Source: own evaluation*

# POLICY ASSESSMENT

## Renewable energy in the power sector

**Medium**

In 2019, Turkey updated its 2023 renewable energy generation target from 30% to 38.8% in its 11th Development Plan, but this was immediately achieved, with the share of renewables in the power mix reaching 44% in 2019. This indicates a lack of policy ambition, as policy is not keeping up with developments in the industry. There is also no long-term renewable energy generation target, which is important for providing investment certainty to the industry. However, **there is a target for the installation of 10 GW of solar and 10 GW of wind capacity over 10 years under the YEKA renewable energy auction programme initiated in 2017.** So far, one solar PV and two onshore wind auctions have been carried out, with another auction for 1 GW of solar PV projects to take place in October 2020. Turkey has utilised a feed-in-tariff mechanism (YEKDEM) since 2007 and is scheduled to run until mid-2021.

*Reference: own evaluation, based on Government of Turkey, 2019*

## Coal phase-out in the power sector

**Low**
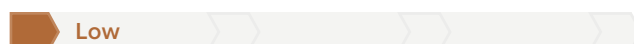
**Turkey currently has no intention to phase out coal; rather, they are planning to ramp up their use of coal** in the electricity system, with 32 GW of new coal capacity planned. This is more planned capacity than any other country in the world, except China, and must be reversed if Turkey is to play its role in limiting warming to 1.5°C. Given limited demand growth in recent years and that new coal project financing is becoming increasingly difficult to source, some of this capacity may not eventuate.

*Reference: own evaluation, based on Global Energy Monitor, 2020*

# TRANSPORT SECTOR

**Emissions from energy used to transport people and goods**

In Turkey, per capita emissions from transport are around the G20 average, but have been rising more than in any other G20 country in recent years. **Policy instruments for improving fuel efficiency and reducing emissions are largely lacking.** In order to stay within a 1.5°C limit, passenger and freight transport need to be decarbonised and emissions from aviation need to decrease.

**Share in energy-related $CO_2$ emissions from transport sector**

*Source: Enerdata, 2020*

$CO_2$

**0.13%** Electricity-related emissions

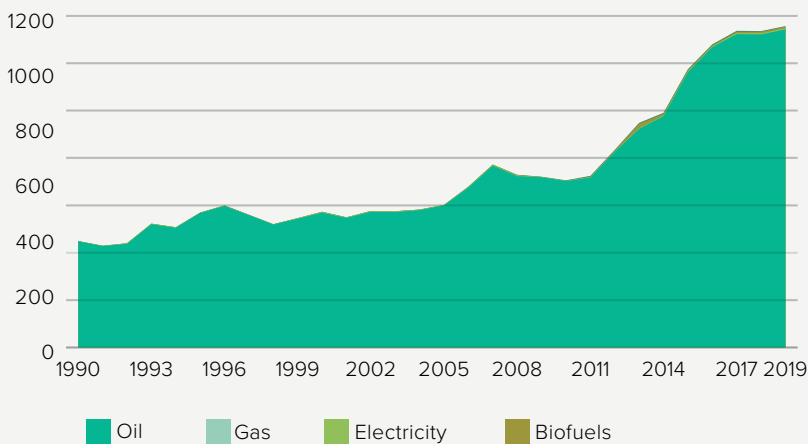**21%** Direct emissions

**1.5°C**

**COMPATIBILITY**
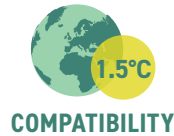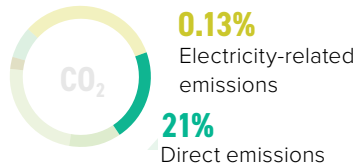
The share of low-carbon fuels in the transport fuel mix must increase to about 60% by 2050.

*Source: Rogelj et al., 2018*

## STATUS OF DECARBONISATION
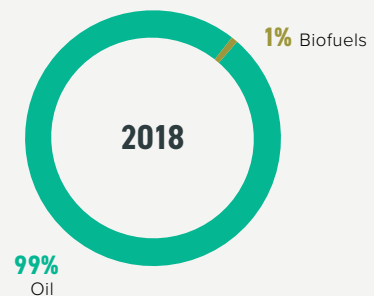
### Transport energy mix

**Final energy consumption of transport by source (PJ/year)**



**1%** Biofuels

**2018**

**99%** Oil

Oil   Gas   Electricity   Biofuels

*Source: Enerdata, 2020*

*Due to rounding, some graphs may sum to slightly above or below 100%.*

Electricity and biofuels combined make up less than 1% of the energy mix in transport and coal is not used for transport.

### Transport emissions per capita

excl. aviation (t$CO_2$/capita)



**1.00** Turkey

**1.16** G20 average

*Data for 2018. Source: Enerdata, 2020*

**Decarbonisation rating: transport emissions compared to other G20 countries**

5-year trend (2013-2018): **Very low**

Current year (2018): **Medium**

*Source: own evaluation*

**Transport emissions: 5-year trend (2013-2018)**

**+37.8%** Turkey

**+5.5%** G20 average

## Aviation emissions per capita[6]

(tCO$_2$/capita)

**0.18** Turkey

**0.16** G20 average

*Data for 2017. Source: Enerdata, 2020*

**Aviation emissions: 5-year trend (2012-2017)**

**+231.8%** Turkey

**+18.7%** G20 average

### Decarbonisation rating: aviation emissions compared to other G20 countries

5-year trend (2012-2017): **Very low**

Current year (2017): **Medium**

*Source: own evaluation*

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## Motorisation rate

**237 VEHICLES PER 1,000 INHABITANTS (2016)**

*Source: Vieweg et al., 2018*

Only 25% of people in Turkey have a car, although this number is rising rapidly. 79% of freight is transported via road.

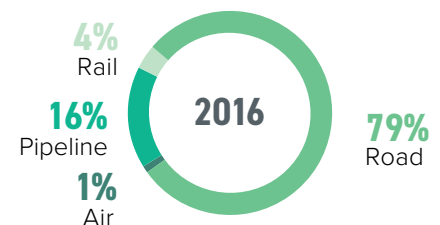## Market share of electric vehicles in new car sales (%)

**No data available**

## Passenger transport

(modal split in % of passenger-km)

**No data available**

## Freight transport

(modal split in % of tonne-km)

**2016**

**4%** Rail
**16%** Pipeline
**1%** Air
**79%** Road

*Data for 2016. Source: Vieweg et al., 2018*

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# POLICY ASSESSMENT

## Phase out fossil fuel cars

**Medium**

Turkey does not plan to phase out fossil-fuel-based cars. While the vehicle registration tax increases with engine size, acting as a disincentive for less fuel-efficient vehicles, the annual ownership tax is lower for older cars, encouraging people to keep these less efficient vehicles for longer. Some tax incentives for electric vehicles exist, but these still account for less than 1% of vehicle sales in Turkey.

*Reference: own evaluation, based on Şenzeybek and Mock, 2019*

## Phase out fossil fuel heavy-duty vehicles

**Low**

Turkey has no strategy for reducing emissions from freight transport, nor does it have fuel efficiency standards for HDVs, and its tax reductions for EVs explicitly exclude HDVs.

*Reference: own evaluation*

## Modal shift in (ground) transport

**Medium**

Turkey has no long-term strategy for achieving modal shift, but as outlined in its 2011 Climate Change Action Plan, it has been vastly expanding investment in its rail network. In 2018, Turkey announced a USD 46bn investment over five years, including a goal to electrify the entire rail network. In June 2020, further plans were announced to more than quadruple the high-speed rail network from 1,200 km to 5,500 km.

*Reference: own evaluation, based on Daily Sabah, 2018, 2020.*

# BUILDING SECTOR

### Emissions from energy used to build, heat and cool buildings

Turkey's building emissions – counting heating, cooking and electricity use – make up about 17% of total $CO_2$ emissions. Per capita, building-related emissions are just below the G20 average, and have remained relatively constant over the last five years.

Building emissions occur directly (burning fuels for heating, cooking, etc) and indirectly (grid-electricity for air conditioning, appliances, etc.)

*Source: Enerdata, 2020*

$CO_2$
**14%** Electricity-related emissions
**11%** Direct emissions

**1.5°C COMPATIBILITY**
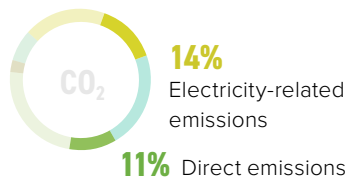
**Global emissions from buildings need to be halved by 2030**, and be 80-85% below 2010 levels by 2050, mostly through increased efficiency, reduced energy demand and electrification in conjunction with complete decarbonisation of the power sector.

*Source: Rogelj et al., 2018*

## STATUS OF DECARBONISATION

### Building emissions per capita

**(incl. indirect emissions) (tCO$_2$/capita)**

**1.28** Turkey
**1.48** G20 average

Building-related emissions per capita are slightly lower than the G20 average. The recent trend has shown a slight reduction in per capita emissions from this sector over the last five years.

*Source: Enerdata, 2020*

**Building emissions: 5-year trend (2014-2019)**

👍 **-0.53%** Turkey    👎 **+1.82%** G20 average

### Residential buildings

**Energy use per m²**

**0.27 GJ PER M²**
0.91
**G20 range**
0.17

### Commercial and public buildings

**Energy use per m²**

**1.67 GJ PER M²**
3.53
**G20 range**
0.15

### Decarbonisation rating: building emissions compared to other G20 countries

5-year trend (2014-2019):    Medium
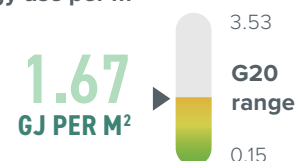
Current year (2019):    Medium

*Source: own evaluation*

Building emissions are largely driven by how much energy is used in heating, cooking, lighting, household appliances, etc. In Turkey, energy use per m² is in the lower range of the G20 countries for residential buildings, and in the middle range for commercial and public ones.

*Different data year for each country*
*Source: Castro-Alvarez et al., 2018*

## POLICY ASSESSMENT

### Near zero energy new buildings

High

Turkey has produced a number of documents that include measures aimed at increasing the energy efficiency of buildings. These include the energy performance of buildings code, which enforces isolation standards, and the 2018 Energy Efficiency Action Plan (NEEAP), which outlined a goal of "nearly zero energy buildings" for newly built private and public buildings. Target years for this goal were intended for publication in 2019, but so far these have still not been announced. **The NEEAP also states that it will be considered for new buildings to have at least class B EPC, but nothing has yet come of this.**

*Reference: own evaluation, based on Republic of Turkey Ministry of Energy and Natural Resources, 2017*

### Renovation of existing buildings

Medium

**Turkey has no long-term retrofitting strategy.** However, there are numerous short-term goals for improving the energy efficiency of existing buildings. These include a 15% reduction in energy use from public buildings by 2023, the transformation of one quarter of the 2010 building stock to sustainable buildings by 2023 (Sustainable Development Turkey, 2012), and the introduction of energy performance contracts to increase energy efficiency investments in public buildings.

*References: own evaluation, based on Republic of Turkey Ministry of Energy and Natural Resources, 2017; Daily Sabah, 2019*

# INDUSTRY SECTOR
### Emissions from energy in the industrial sector

**Industry-related emissions make up a third of $CO_2$ emissions in Turkey.** While Turkey continues to make inroads in decarbonising its industry sector, more stringent instruments for reducing energy use and emissions in industry are required for a 1.5°C pathway.

**Share in energy-related $CO_2$ emissions from industrial sector**

*Source: Enerdata, 2020*

**24%** Direct emissions

**15%** Electricity-related emissions

**1.5°C COMPATIBILITY**
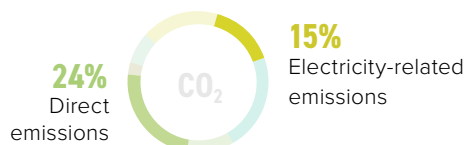
**Industrial emissions need to be reduced by 65-90%** from 2010 levels by 2050.

*Source: Rogelj et al., 2018*

## STATUS OF DECARBONISATION

### Industry emissions intensity[7]
**(tCO_2e/USD2015 GVA)**

**0.53** Turkey

**0.71** G20 average

*Data for 2016. Sources: Enerdata, 2020, Gütschow et al., 2019*

**Industry emissions: 5-year trend (2011-2016)**

👍 **-18%** Turkey

👍 **-12%** G20 average

**Decarbonisation rating: emissions intensity of industry compared to other G20 countries**

5-year trend (2011-2016):  **High**

Current year (2016):  **High**

*Source: own evaluation*

### Carbon intensity of cement production[8]
**(kgCO_2/tonne product)**

No data available — Turkey

**614** World average
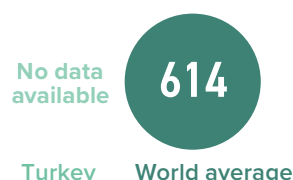
There is no data on the carbon intensity of Turkey's cement production.

*Data for 2016. Source: CAT Decarbonisation Data Portal, 2020.*

### Carbon intensity of steel production[8]
**(kgCO_2/tonne product)**

**785** Turkey

**1,900** World average

Steel production and steelmaking are significant GHG emission sources, and are challenging to decarbonise. Turkey's steel industry is less intensive than the global average.

*Data for 2016. Sources: World Steel Association, 2018; CAT Decarbonisation Data Portal, 2020*

## POLICY ASSESSMENT

### Energy Efficiency

**Medium**

**Turkey is ranked 9th out of 25 key industrial countries for industrial energy efficiency** by the International Energy Efficiency Scorecard 2018. The scorecard showed that Turkey was lacking in R&D for manufacturing, policy to encourage energy management, and minimum efficiency standards for electric motors. In its National Energy Efficiency Action Plan 2017-2023, it **aims to reduce energy intensity by at least 10%** in each sub-sector, implement performance standards, scale up cogeneration systems, and support energy efficiency projects through low-interest loans.

*Reference: own evaluation, based on Republic of Turkey Ministry of Energy and Natural Resources, 2017*

# LAND USE SECTOR

**Emissions from changes in the use of the land**

**NET SINK OF EMISSIONS**

For staying within the 1.5°C limit, Turkey needs to make the land use and forest sector a net sink of emissions, e.g. by halting the expansion of residential areas and large-scale infrastructure projects, and by creating new forests.
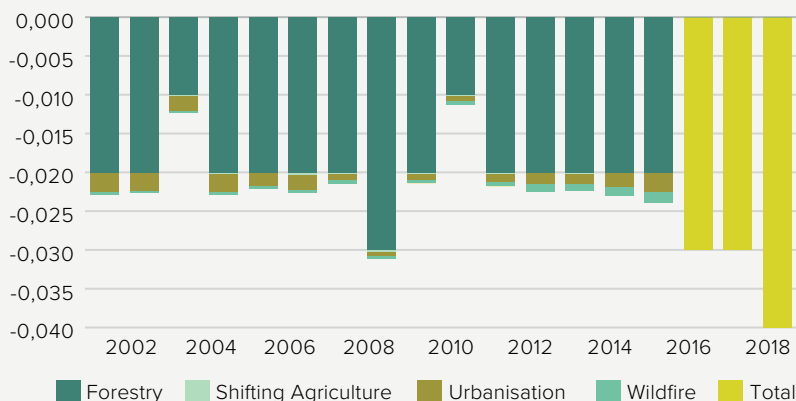
**1.5°C COMPATIBILITY**

**Global deforestation needs to be halted** and changed to net $CO_2$ removals by around 2030.

*Source: Rogelj et al., 2018*

## Global tree-cover loss

**Gross tree-cover loss by dominant driver (million hectares)**



Legend: Forestry | Shifting Agriculture | Urbanisation | Wildfire | Total

This indicator covers only gross tree-cover loss and does not take tree-cover gain into account. It is thus not possible to deduce from this indicator the climate impact of the forest sector. 2000 tree cover extent – >30% tree canopy.

*Source: Global Forest Watch, 2019*

From 2001 to 2018, **Turkey lost 461 Mha of tree-cover, equivalent to a 4.6% decrease since 2000.** This does not take tree-cover gain into account. The main drivers for tree loss are forestry operations and urbanisation.

## POLICY ASSESSMENT

### Target for net-zero deforestation

Medium

The land use, land use change and forestry sector has been a net sink for Turkey since 2008, and there is a current target in place to increase the total share of forest cover to 30% by 2023. In November 2019, Turkey planted 11 million trees in one day, also breaking the record for most trees planted in a single location in one hour. However, in January 2020, the head of the Turkish Agriculture and Forestry union reported that 90% of the saplings his team inspected were already dead, noting they were planted at the wrong time of year and received insufficient water. Despite all of these positive moves Turkey has yet to establish policies or a national target for reaching zero deforestation by 2020 and, therefore, has been rated as "medium".

*References: own evaluation, based on Republic of Turkey Ministry of Energy and Natural Resources, 2017; Kent, 2020.*

# AGRICULTURE SECTOR

**Emissions from agriculture**

**DIETARY SHIFTS ARE NEEDED**

Non-energy agricultural emissions in Turkey come mainly from digestive processes in animals, livestock manure and the use of synthetic fertilisers. They make up around 12% of Turkey's total GHG emissions. A 1.5°C 'fair-share' pathway requires dietary shifts and less fertiliser use.

**1.5°C COMPATIBILITY**

Methane emissions (mainly enteric fermentation) need to decline to 10% by 2030 and to 35% by 2050 (from 2010 levels). Nitrous oxide emissions (mainly from fertilisers and manure) need to be reduced by 10% by 2030 and by 20% by 2050 (from 2010 levels).

*Source: Rogelj et al., 2018*

## Emissions from agriculture (excluding energy)



TOTAL 46 MtCO₂e
- 34% Enteric Fermentation
- 6% Crop Residues
- 25% Synthetic Fertilisers
- 33% Manure
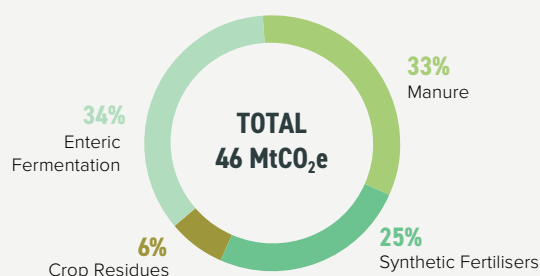
*Data for 2017. Source: FAO, 2019*

In Turkey, the largest sources of non-energy GHG emissions in the agricultural sector are digestive processes in animals (enteric fermentation), livestock manure and the use of synthetic fertilisers. A more efficient use of fertilisers and dietary changes can help reduce emissions. Turkey has an ambitious target for increasing agricultural productivity by 2023, aiming to be in the top five global producers, which implies a significant future increase in agricultural GHG emissions.

*Due to rounding, some graphs may sum to slightly above or below 100%.*

## MITIGATION: TARGETS AND AMBITION

The combined mitigation effect of nationally determined contributions (NDC) submitted by September 2020 is not sufficient and will lead to a warming of 2.7°C by the end of the century. This highlights the urgent need for all countries to submit more ambitious targets by 2020, as they agreed in 2015, and to urgently strengthen their climate action to align to the Paris Agreement's temperature goal.

## AMBITION: 2030 TARGETS

### Intended Nationally Determined Contribution (NDC): Mitigation

**Targets**

Up to 21% reduction in GHG emissions from business-as-usual level by 2030

**Actions**

Actions specified in the following sectors: energy, industry, transport, buildings, agriculture, waste, forestry

### Climate Action Tracker (CAT) evaluation of INDC and actions

| ● | Critically Insufficient |
| | Highly Insufficient |
| | Insufficient |
| | 2°C Compatible |
| | 1.5°C Compatible |
| | Role Model |

NDCs with this rating fall well outside of a country's 'fair-share' range and are not at all consistent with holding warming to below 2°C let alone with the Paris Agreement's stronger 1.5°C limit. If all government NDCs were in this range, warming would exceed 4°C.

Turkey is one of only a handful of countries that have not ratified the Paris Agreement and only has an INDC. It has made little progress on climate action. It continues to rely on fossil fuel, despite the ongoing reduction in renewable energy technology costs, which could provide reliable power cost-effectively.

*Evaluation as at October 2020, based on country's INDC.*
*Source: Climate Action Tracker*

## TRANSPARENCY: FACILITATING AMBITION

Countries are expected to communicate their NDCs in a clear and transparent manner in order to ensure accountability and comparability.

The NDC Transparency Check has been developed in response to Paris Agreement decision (1/CP.21) and the Annex to decision 4/CMA.1. While the Annex is only binding from the second NDC onwards, countries are "strongly encouraged" to apply it to updated NDCs, due in 2020.

### NDC Transparency Check recommendations
*For more visit www.climate-transparency.org/ndc-transparency-check*

As of October 2020, Turkey has not ratified the Paris Agreement.

## AMBITION: LONG-TERM STRATEGIES

| Status | No long-term target |
| --- | --- |
| 2050 target | |
| Interim steps | |
| Sectoral targets | |
| Net-Zero target | |

The Paris Agreement invites countries to communicate mid-century, long-term, and low-GHG emissions development strategies by 2020. Long-term strategies are an essential component of the transition toward net-zero emissions and climate-resilient economies.

# 3. FINANCE
## MAKING FINANCE FLOWS CONSISTENT WITH CLIMATE GOALS

**PARIS AGREEMENT**  **Make finance flows consistent with a pathway towards low-GHG emissions and climate-resilient development.**

**NO CARBON REGULATION**  Turkey spent just under USD 5bn on fossil fuel subsidies in 2017, primarily on petroleum. There is **no carbon pricing scheme nor any financial policy or regulation** to support the shift from brown to green.
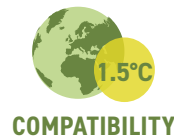
**1.5°C COMPATIBILITY**  Investment in green energy and infrastructure needs to outweigh fossil fuels investments by 2025.

*Source: Rogelj et al., 2018*

## FISCAL POLICY LEVERS

Fiscal policy levers **raise public revenues and direct public resources.** Critically, they can shift investment decisions and consumer behaviour towards low-carbon, climate-resilient activities by reflecting externalities in the price.

### Fossil Fuel  Subsidies

**Turkey Fossil fuel subsidies (USD billions)**
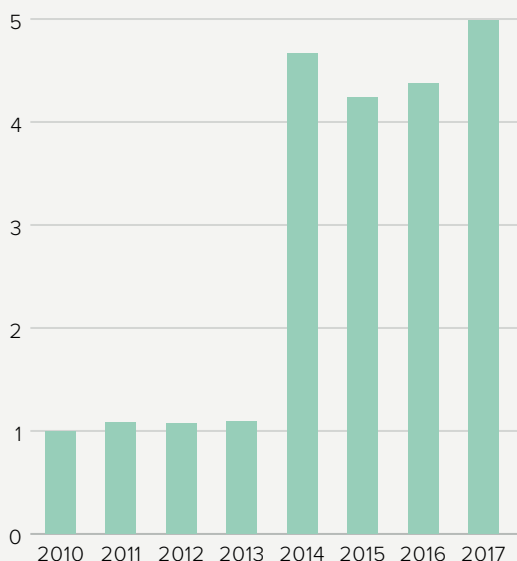


*Source: OECD-IEA Fossil Fuel Support database, 2020*

### Fossil Fuel Subsidies by  fuel type

**Subsidies by fuel type**



1% Natural gas
12% Coal
87% Petroleum
2019

*Source: OECD-IEA Fossil Fuel Support database, 2020*
*Due to rounding, some graphs may sum to slightly above or below 100%.*

In 2017, Turkey's fossil fuel subsidies totalled USD 5bn (compared to USD 1bn in 2010 with a substantial increase in annual subsidies after 2013). 90% of the subsidies identified were for the consumption of fossil fuels, with the remainder for production. The highest amount of quantified subsidies was for petroleum, at USD 4.3bn, followed by coal at USD 0.6bn. In absolute terms, the largest subsidy was the exemptions under the special consumption tax for fuels (naphtha, petroleum coke and petroleum bitumen), resulting in USD 2.4bn. According to the analysis carried out by SHURA Energy Transition Center, this figure may be higher than estimated in the OECD inventory. Moreover, SHURA estimates that USD 288m was spent in 2017 to compensate for the losses of state-owned coal enterprises.

*References: OECD-IEA Fossil Fuel Support database, 2020; SHURA, 2019*

## Carbon Pricing  and Revenue

**No data available**  No explicit carbon pricing scheme has been in place in Turkey between 2007 to 2019. Turkey does not have a national carbon tax or an emissions trading scheme, but the introduction of a carbon pricing scheme is being considered. The proportion of domestic emissions to be covered or the price to be imposed on emissions are yet to be decided.

**CORONAVIRUS RECOVERY**  The Turkish Economic Stability Shield package announced in response the COVID-19 crisis does not direct finance towards climate-related ends. Priority has instead been given to supporting exporters, and small and medium enterprises (SMEs), and providing various tax cuts for businesses. The European Bank of Reconstruction and Development, an institution that invests heavily in Turkey, stated that governments should take careful policy action that protects the environment and should not support fossil fuels.

*References: Lexology, 2020; EBRD, 2020*

# PUBLIC FINANCE

**Governments steer investments through their public finance institutions**, including via development banks both at home and overseas, and green investment banks. Developed G20 countries also have an obligation to provide finance to developing countries, and public sources are a key aspect of these obligations under the UNFCCC.

## Public finance for  fossil fuels

**No data available**

There is no available data for Turkey due to poor reporting from Turk Eximbank and the Development Bank of Turkey. However, it is estimated that Turkey provided at least USD 400m a year in public finance for fossil fuels from its government-owned banks.

## Provision of  international public support

**(annual average 2017 and 2018)**

Climate finance contributions are sourced from Party reporting to the UNFCCC.

**Bilateral, regional and other channels**

**No data available**

Theme of support:

**No data available**

**Multilateral climate finance contributions**

**No data available**

Theme of support:

**No data available**

**Core / General Contributions**

Annual average contribution:

**No data available**

Turkey is not listed in Annex II of the UNFCCC and is, therefore, not formally obliged to provide climate finance. It is, however, an Annex I country and submits biennial reporting to the UNFCCC. While Turkey may channel international public finance towards climate change via multilateral and other development banks, it has not been included in this report.

# FINANCIAL POLICY AND REGULATION

## Financial policy and regulation

Through policy and regulation governments can **overcome challenges to mobilising green finance**, including: real and perceived risks, insufficient returns on investment, capacity and information gaps.

| Category | Instruments | Objective | Under Discussion/ implementation | None identified | | |
|---|---|---|---|---|---|---|
| Green Financial Principles | n/a | This indicates political will and awareness of climate change impacts, showing where there is a general discussion about the need for aligning prudential and climate change objectives in the national financial architecture. | 🟢 | | | |
| | | | **Mandatory** | **Voluntary** | **Under Discussion/ implementation** | **None identified** |
| Enhanced supervisory review, risk disclosure and market discipline | Climate risk disclosure requirements | Disclose the climate-related risks to which financial institutions are exposed | | | 🟠 | |
| | Climate-related risk assessment and climate stress-test | Evaluate the resilience of the financial sector to climate shocks | | | | 🟠 |
| Enhanced capital and liquidity requirements | Liquidity instruments | Mitigate and prevent market illiquidity and maturity mismatch | | | | 🟠 |
| | Lending limits | Limit the concentration of carbon-intensive exposures | | | | 🟠 |
| | | Incentivise low carbon-intensive exposures | | | | 🟠 |
| | Differentiated reserve requirements | Limit misaligned incentives and channel credit to green sectors | | | | 🟠 |

Turkish banks have followed a market-led route to sustainable banking, aligning with national goals as well as international principles and good practice. In 2014, the Banks Association of Turkey (BAT) **issued voluntary sustainability guidelines for the banking sector**, prepared by a working group on the role of the financial sector in sustainable growth, with the participation of 18 commercial banks. Meanwhile, Turkey's Banking Regulation and Supervision Agency (BRSA), a member of the IRC Sustainable Banking Network since 2015, is undertaking **a survey of sustainability-related policies and regulations, as well as working to enhance banks' awareness of sustainability issues.**

## Intended Nationally Determined Contribution (NDC): Finance

| | |
|---|---|
| **Conditionality** | NDC partly conditional on international financial support (not specified) |
| **Investment needs** | Not specified |
| **Actions** | Not mentioned |
| **International market mechanisms** | Turkey aims to use carbon credits from international market mechanisms to achieve its 2030 mitigation target |

# ENDNOTES

For more detail on the sources and methodologies behind the calculation of the indicators displayed, please download the Technical Note at: www.climate-transparency.org/g20-climate-performance/g20report2020

1  'Land use' emissions is used here to refer to land use, land use change and forestry (LULUCF). The Climate Action Tracker (CAT) derives historical LULUCF emissions from the UNFCCC Common Reporting Format (CRF) reporting tables data converted to the categories from the IPCC 1996 guidelines, in particular separating Agriculture from Land use, land use change and forestry (LULUCF), which under the new IPCC 2006 Guidelines is integrated into Agriculture, Forestry, and Other Land Use (AFOLU).

2  The 1.5°C fair share ranges for 2030 and 2050 are drawn from the CAT, which compiles a wide range of perspectives on what is considered fair, including considerations such as responsibility,

capability, and equality. Countries with 1.5°C fair-share ranges reaching below zero, particularly between 2030 and 2050, are expected to achieve such strong reductions by domestic emissions reductions, supplemented by contributions to global emissions reduction efforts via, for example, international finance. On a global scale, negative emissions technologies are expected to play a role from the 2030s onwards, compensating for remaining positive emissions. The CAT's evaluation of NDCs shows the resulting temperature outcomes if all other governments were to put forward emissions reduction commitments with the same relative ambition level.

3  In order to maintain comparability across all countries, this report utilises the PRIMAP year of 2017. However, note that Common Reporting Format (CRF) data is available for countries which have recently updated GHG inventories.

4  The Decarbonisation Ratings assess the current year and average of the most recent five years

(where available) to take account of the different starting points of different G20 countries.

5  The selection of policies rated and the assessment of 1.5°C compatibility are informed by the Paris Agreement, the IPCC's 2018 SR15 and the Climate Action Tracker (2016). The table below displays the criteria used to assess a country's policy performance.

6  This indicator adds up emissions from domestic aviation and international aviation bunkers in the respective country. In this Country Profile, however, only a radiative forcing factor of 1 is assumed.

7  This indicator includes only direct energy-related emissions and process emissions (Scope 1) but not indirect emissions from electricity.

8  This indicator includes emissions from electricity (Scope 2) as well as direct energy-related emissions and process emissions (Scope 1).

| On endnote 5. | Low | Medium | High | Frontrunner |
|---|---|---|---|---|
| Renewable energy in power sector | No policy to increase the share of renewables | Some policies | Policies and longer-term strategy/ target to significantly increase the share of renewables | Short-term policies + long-term strategy for 100% renewables in the power sector by 2050 in place |
| Coal phase-out in power sector | No target or policy in place for reducing coal | Some policies | Policies + coal phase-out decided | Policies + coal phase-out date before 2030 (OECD and EU28) or 2040 (rest of the world) |
| Phase out fossil fuel cars | No policy for reducing emissions from light-duty vehicles | Some policies (e.g. energy/emissions performance standards or bonus/ malus support) | Policies + national target to phase out fossil fuel light-duty vehicles | Policies + ban on new fossil-based light-duty vehicles by 2035 worldwide |
| Phase out fossil fuel heavy-duty vehicles | No policy | Some policies (e.g. energy/emissions performance standards or support) | Policies + strategy to reduce absolute emissions from freight transport | Policies + innovation strategy to phase out emissions from freight transport by 2050 |
| Modal shift in (ground) transport | No policies | Some policies (e.g. support programmes to shift to rail or non-motorised transport) | Policies + longer-term strategy | Policies + longer-term strategy consistent with 1.5°C pathway |
| Near zero energy new buildings | No policies | Some policies (e.g. building codes, standards or fiscal/financial incentives for low-emissions options) | Policies + national strategy for near zero energy new buildings | Policies + national strategy for all new buildings to be near zero energy by 2020 (OECD countries) or 2025 (non-OECD countries) |
| Energy efficiency in Industry | 0-49% average score on the policy-related metrics in the ACEEE's International Energy Efficiency Scorecard | 50-79% average score on the policy-related metrics in the ACEEE's International Energy Efficiency Scorecard | 80-89% average score on the policy-related metrics in the ACEEE's International Energy Efficiency Scorecard | Over 90% average score on the policy-related metrics in the ACEEE's International Energy Efficiency Scorecard |
| Retrofitting existing buildings | No policies | Some policies (e.g. building codes, standards or fiscal/financial incentives for low-emissions options) | Policies + retrofitting strategy | Policies + strategy to achieve deep renovation rates of 5% annually (OECD) or 3% (non-OECD) by 2020 |
| Net-zero deforestation | No policy or incentive to reduce deforestation in place | Some policies (e.g. incentives to reduce deforestation or support schemes for afforestation / reforestation in place) | Policies + national target for reaching net-zero deforestation | Policies + national target for reaching zero deforestation by 2020s or for increasing forest coverage |

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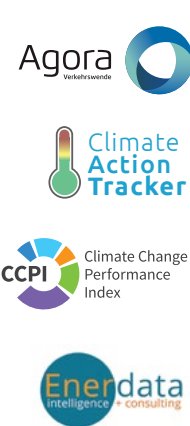## ABOUT CLIMATE TRANSPARENCY

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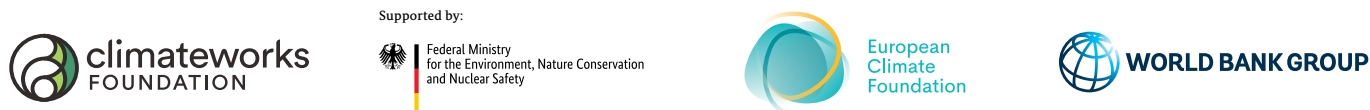
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