STATE OF ISRAEL
Ministry of Environmental Protection

Israel's Second Biennial Update Report

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- Total water consumption in Israel has increased by 16% over the 2000-2019 period due to the high population growth rate.

Water scarcity has led to the development of advanced technologies for water desalination and wastewater treatment and recovery.

Climate Profile

- The is an increase of mean annual temperatures since the 1990s.
- 2010-2019 were the hottest since 1951, with 2018 and 2019 among the seven hottest years on record.

Population Profile

- Israel's population have steadily grown since 2000 (9 million residents in 2019.)
- The annual population growth rate (1.95%) is one of the highest among OECD countries
- The population density is steadily increasing: from 279 people/m^2 in 2000 to 398 people/m^2 in 2019.

Economic Profile

- Israel had experienced strong economic growth over 2010 – 2019:
  - Average annual GDP growth = 4.5%
  - Average per capita GDP growth = 1.8%
- However, GDP decreased by 2.2% in 2020 compared to 2019 (due to the COVID-19 crisis).

Energy Profile

- The share of natural gas in total fuel mix continues to rise due to its use for power generation and in the manufacturing and large commercial sectors.
- In 2020, total primary energy supply decreased by 3.2% relative to 2019 (due to the COVID-19 crisis).
- Improvement of final total energy consumption per capita (-9%) and per unit of GDP (- 8%) during the 2015-2019 period.
- Electricity consumption continues to increase: from around 54 TWh in 2010 to 67.1 TWh in 2020, representing an annual growth rate of 3.3%.
- In 2020, renewables accounted for 6% of power generation, coal 26%, natural gas 68%. Renewables share increased to 8.2% in 2021, and around 10% in 2022 (estimated value).

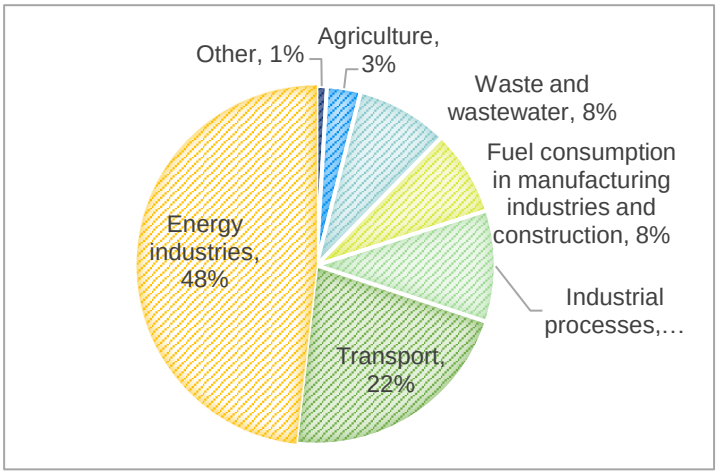
Greenhouse Gas (GHG) Inventory

Emissions profile

In 2020, Israel's total GHG emissions were 77.42 million tons (Mt) CO_2 equivalent (CO_2e), representing an absolute increase of around 3.5% relative to 2010 emissions but a decrease of 1.5% relative to 2015 emission levels. Emission intensity has shown an overall declining trend since 1996 both in terms of GHG emissions per capita and in terms of GHG emissions per GDP (8.4 tCO2e/capita and 0.22 tCO2e/$1000 GDP in 2020).

Key emission trends by sector

Figure 1: GHG emissions – Sectorial shares in 2020



• **Energy industries** remain the largest source of CO_2e emissions (37.4 MtCO2e in 2020). Emissions from this sector peaked in 2012 due to a natural gas shortage that led to increased use of more GHG intensive fossil fuels, predominantly in the power sector; emissions have since declined due to an increasing use of natural gas.

• **Transport** is the second largest source of GHG emissions (16.9 MtCO2e in 2020). Transport emissions increased by 6.2% between 2015 and 2019, as the total kilometers traveled by private vehicles increased by 19.5% during the same period. However, emissions decreased by 4.2% relative to 2015 in 2020, **due to the COVID-19 pandemic and the several lockdowns and travel restrictions.**

• **Industrial Processes emissions** (7.826 MtCO2e in 2020) increased by 25.9% relative to 2015, mainly due to the increase in F-gas consumption (+222% since 2008);

• Meanwhile, **fuel consumption in Manufacturing Industries and Construction** emissions (5.99 MtCO2e in 2020), increased by 15% in 2020 relative to 2015, and are mainly due to cement production.

• **Agricultural** emissions are mainly methane from enteric fermentation and manure management, and amounted to 2.3 MtCO2e in 2020, a 2.3% increase from 2015 levels.

• **Waste and wastewater** emissions (6.4 MtCO2e in 2020) are mainly methane emissions from landfill sites and increased by 3.1% since 2015.

Key emission trends by gas

Parameter	CO2	CH4	N2O	Fluorinated gases
Share of total GHG emissions in 2020	80.7% *(91% in 2000)*	9.5%	2.3%	7.5%
Evolution relative to 2015	-3.5%	+3.2%	-2.3%	+60%
Main factor of the evolution	Fuel combustion (97% of total CO_2 emissions), mainly from Energy Industries	Solid waste disposal (77% of total CH_4 emissions)	Agriculture	HFCs (95% of F-gas emissions)

Mitigation policies and measures

In July 2021 Israel submitted an updated NDC under the Paris Agreement, which included an unconditional, absolute economy-wide emission reduction target of 27% relative to 2015 levels by 2030 and 85% relative to 2015 levels by 2050 (12 MtCO2e). The new targets were approved by Government on July 25 2021 (Government Decision 171: Transition to a Low-Carbon Economy). Moreover, at COP 26 in Glasgow, Israeli Prime Minister Naftali Bennett declared that Israel would seek to attain net zero carbon emissions by 2050. The updated NDC includes the following sectoral targets:

Table 1: 2030 Sectoral Targets

Sector	2030 GHG Target relative to 2015	Supporting Targets
Power Generation	30% reduction	• Phase-out coal-fired power generation by 2026 • 30% renewable generation by 2030
Waste (excl. wastewater)	47% reduction	• Reduction from 80% landfilling of MSW in 2020 to only 20% by 2030, with zero landfilling of untreated organic waste, paper and cardboard
Transportation	3.3% increase	• 95% reduction in GHG emission intensity of new cars and light commercial vehicles, relative to 2020 • As of 2026, 100% of new municipal buses purchased will be clean vehicles
Industry	30%	• Reduction of industrial gas emissions in line with the Kigali Amendment to the Montreal Protocol
Final Energy Intensity	122 MWh per NIS 1 million GDP	

Targets – current status

Table 2: Israel's progress in meeting its primary GHG targets

National Target	2015	2017	2018	2019	2020 (Latest Reported Value)	2021 (Estimated value)*	2030 (Target Value)	2050 (Target Value)
National GHG Emissions ($MtCO_2e$)	79	78	78	79	77	76.6	58	12

*Based on initial data - MRV.

National GHG Emissions Reduction Plan, 2016-2021

In April 2016, the government approved a National Plan to Reduce GHG Emissions and Increase Energy Efficiency. As of 2019, the plan had achieved a total emission reduction of approximately 10 MtCO2e, relative to BAU levels, primarily due to the following key abatement measures: 1) Phasing-out coal-fired

electricity generation (7.4 $MtCO_2e$); 2) Renewable electricity (0.8 $MtCO_2e$; 3) Energy efficiency (overarching measure) (0.7 $MtCO_2e$); and 4) Natural gas fuel switch in industry (0.72 $MtCO_2e$).

National Action Plan on Climate Change, 2022-2026

In October 2021, Israel published an updated National Action Plan on Climate Change (2022-2026). The implementation plan includes 100 economy-wide and sectoral measures regarding mitigation, adaptation, finance and investment, and reporting. In addition to the supporting targets already presented above, the mitigation plan includes the following key steps:

Name of Mitigation action	Key steps planned to achieve action
Energy	• Focus on dual-use PV in built areas • Allocation of NIS 600 million (approximately USD 190 million) in new government grants for sustainable energy in industry, businesses and local authorities • Mandatory Green Building standard for new construction and targets for new Zero-Energy Buildings
Transportation	• Transition from private vehicles to sustainable transport, including a budget of more than NIS 250 billion (approximately USD 80 billion) for mass transport infrastructure and other sustainable transport projects • Transition to zero emission vehicles, including NIS 60 million (approximately USD 20 million) for charging infrastructure
Industry	• Reduction in the use of fossil fuels through sustainable energy grants, including electrification and hydrogen • Transition to green refrigerants in line with the Kigali Amendment to the Montreal Protocol
Waste	• Revised landfill levy, ban on landfilling unsorted waste and untreated organic waste in 2030, and support for recycling and alternative waste treatment infrastructure • Waste reduction at the source • Landfill gas and utilization at a rate of no less than 50% of methane generation by 2030
Economy-wide measures	• Climate legislation • Carbon pricing on fossil fuels • Financing, investment and climate innovation

Decision making and monitoring processes

Israel's NDC update and long-term low carbon development goals were developed in a broad, multi-stakeholder process, led by the Ministry of Environmental Protection together with the Israel Democracy Institute, the OECD and key Ministries.

Israel monitors emission reduction on both a national and a policy level in accordance with the national Monitoring, Reporting and Verification (MRV) system, which was created in 2016. Since 2018, an annual report is submitted to the Government, evaluating the effectiveness of abatement measures and the progress being made in meeting GHG reduction targets, as well as providing recommendations on additional measures. MRV data estimates the total GHG emissions of Israel for 2021 to 76.6 MtCO2e.

Financial, Technology, and Capacity Building Needs and Support Received

There are knowledge gaps and a capacity need for more expertise concerning the preparation of a national emissions inventory report, as well as regarding the methods and resolution for calculation of specific emission sources, such as agriculture, energy, solvent and other product use.

However, despite its status as a non-Annex I country, Israel receives little climate change related international aid and provides aid to a number of countries, in particular on agricultural and water related courses. MASHAV, Israel's Agency for International Development Cooperation at the Ministry of Foreign Affairs and The Keren Kayemeth Le-Israel – Jewish National Fund (KKL-JNF), a non-profit, quasi-governmental organization, provide programs and host projects and workshops both locally and abroad. During 2018-2019, 4,113 delegates participated in courses conducted in Israel and 2,729 participated in courses held by Israel abroad.

National Circumstances

Key developments since the last National Communication

- The population of Israel has been rising steadily since 2000, reaching 9.05 million residents in 2019 (yearly average), with a population density of 398 people per km.[1] During 2000-2019, the annual growth rate was 1.95%, of which approximately 18% originated from net immigration.[2]
- Israel's economic growth has continued to be strong, with an average annual growth of approximately .40% over 2010-2019.[3] However, the COVID-19 pandemic which began in early 2020 has had profound effects, with a -2.2% decrease in the GDP between 2019 and 2020.
- The share of natural gas in the total primary energy mix rose from approximately 23% in 2010 to approximately 30% in 2016, to 39% in 2019 and 43% in 2020. In 2019, the Leviathan gas field began supplying large amounts of natural gas, enabling both exports to neighboring countries, as well as increased competition in the market. [4]
- The share of coal in the primary energy mix has decreased from approximately 32% in 2010 to 23% in 2016, and then to 21% in 2019 and 20% in 2020; and the share of petroleum fuels fell from approximately 42% in 2010 to 38% in 2015, and then to 36% in 2020.
- Renewables accounted for 6% of power generation in 2020; natural gas accounted for 68% and coal for 26%. Electricity consumption increased from approximately 54 TWh in 2010 to approximately 61 TWh in 2016 to 67.1 TWh in 2020.
- Water consumption per capita in 2019 was 247 m^3, an improvement of 19% relative to per capita consumption of 306 m^3 in 2000.
- In 2019, 87% of domestic wastewater was recycled and used for agriculture as well as for urban irrigation and landscaping.
- 2019 was the seventh hottest year documented in Israel, with a mean daily temperature of 20.8°C, 1.3°C higher than the 1961-1990 average. 2018 was even hotter, with a mean daily temperature of 21.5°C, 2°C higher than the 1961-1990 average.

In this report, recent data from 2018-2019 is compared to 2015-2016 data (reported in Israel's Third National Communication Report) and/or to previous reference years (2010, 2000, etc). 2020 data is presented for specific parameters however due to COVID-19, 2010-2019 is more indicative of the long-term trends.

[1] Central Bureau of Statistics, 2020
[2] Central Bureau of Statistics, 2020
[3] World Bank, 2020
[4] Natural Gas Authority, Ministry of Energy, 2019

Geographic profile

The State of Israel is located on the southwest tip of the Asian continent, in the eastern basin of the Mediterranean Sea. The country lies at a latitude between 29° and 33° north of the Equator, with a total area of 22,072 km^2 (including East Jerusalem as of 1967, and the Golan Heights as of 1982), 97.6% of which is land and 2.4% of which are bodies of water (Sea of Galilee and the Dead Sea).[5]

Land resources

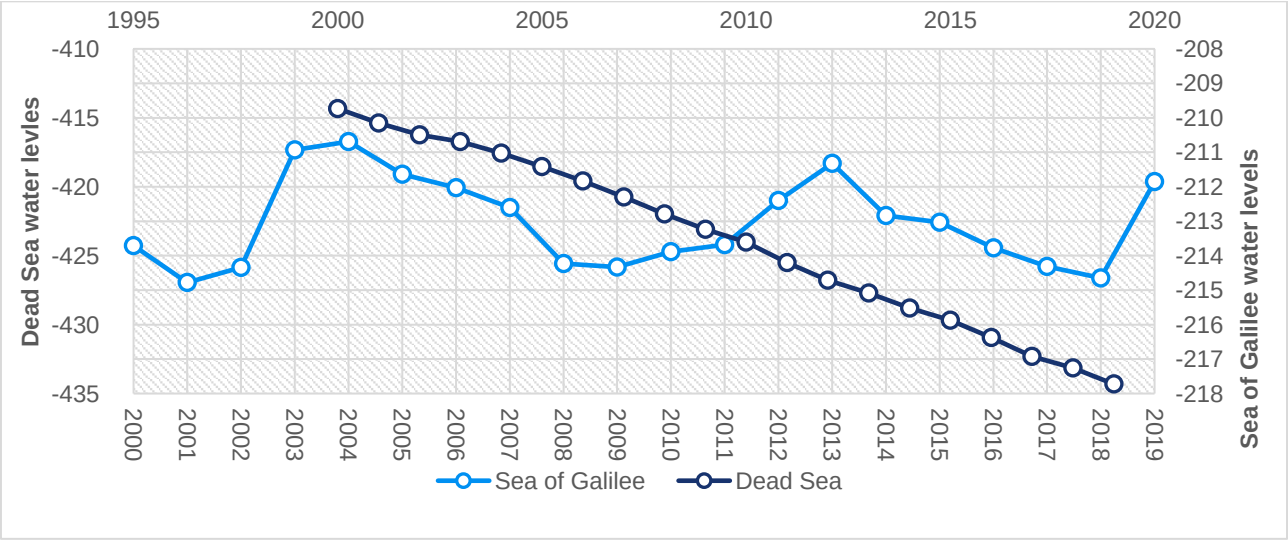
Land resources in Israel include fertile plains and arid zones, coastline and desert, mountain ranges, and the lowest point on earth — the Dead Sea — all in close proximity. Arid zones comprise approximately 45% of the country. The remainder includes plains and valleys (25%), mountain ranges (16%), the Jordan Rift Valley (9%) and the coastal strip (5%). The most recent data regarding Israel's land resources is from 2013; for further detail please see the Third National Communication Report submitted in 2018.

Water resources[6]

Israel is located in an area characterized by scarcity of natural water resources, and faces various challenges regarding water resource management. Natural freshwater resources can be divided into aboveground reservoirs (the Sea of Galilee) and subterranean groundwater reservoirs (aquifers).

As can be seen in the following graph, the Dead Sea water level has continued to decline at a rate of approximately one meter per year. This decline is attributed to the diversion of incoming water from the Jordan River to the north and to industrial utilization of mineral resources from the Dead Sea. From 2015 to 2018, water levels in the Sea of Galilee declined steadily at an average rate of 0.54 meters per year, due to a combination of water consumption and low precipitation. However, from 2018 to 2019 Sea of Galilee levels increased by 2.8 meters to 211.85 meters below sea level, due to large precipitation volume during that year.

Figure 2: Sea of Galilee and Dead Sea levels relative to mean sea level (meters)

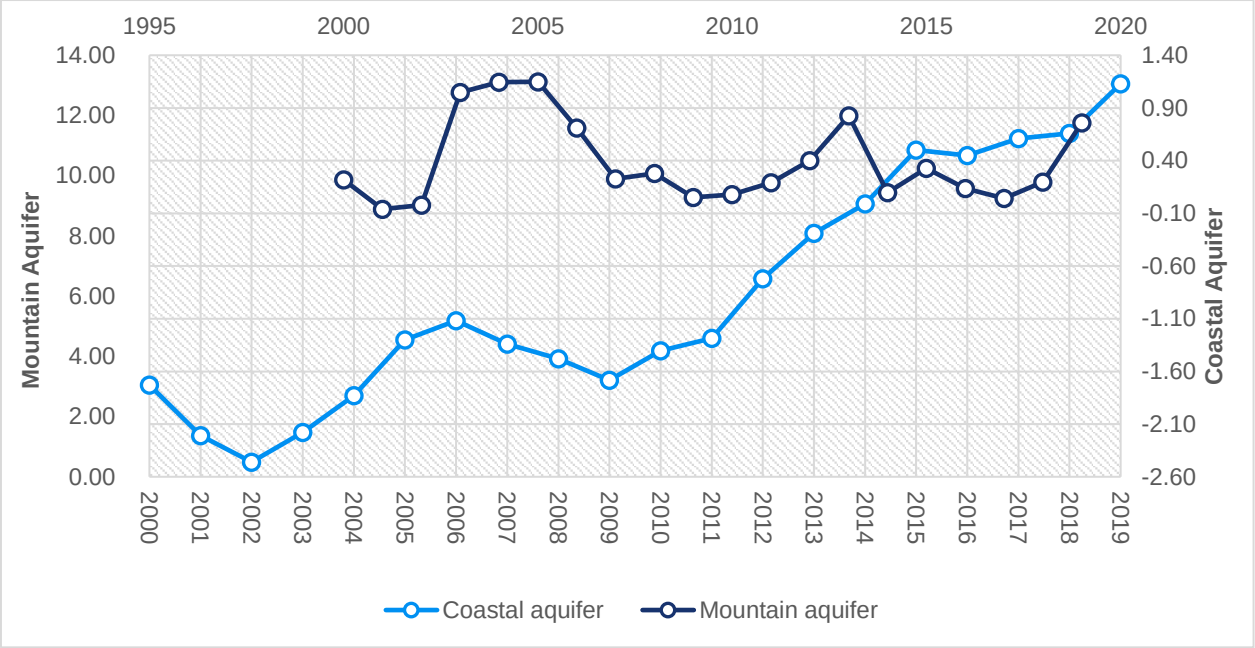


[5] Central Bureau of Statistics, 2020

[6] Central Bureau of Statistics, 2020

Groundwater (aquifers) serves as one of Israel's primary water sources. Water levels are directly affected by consumption activities and precipitation infiltration into aquifers. From 2002 to 2019, coastal aquifer levels increased, which can be attributed to decreased pressure on the water resources due to the growing use of desalinated seawater. Mountain aquifer levels remained relatively stable.

Figure 3: Mountain and Coastal Aquifers water levels relative to mean sea level (meters)[7]

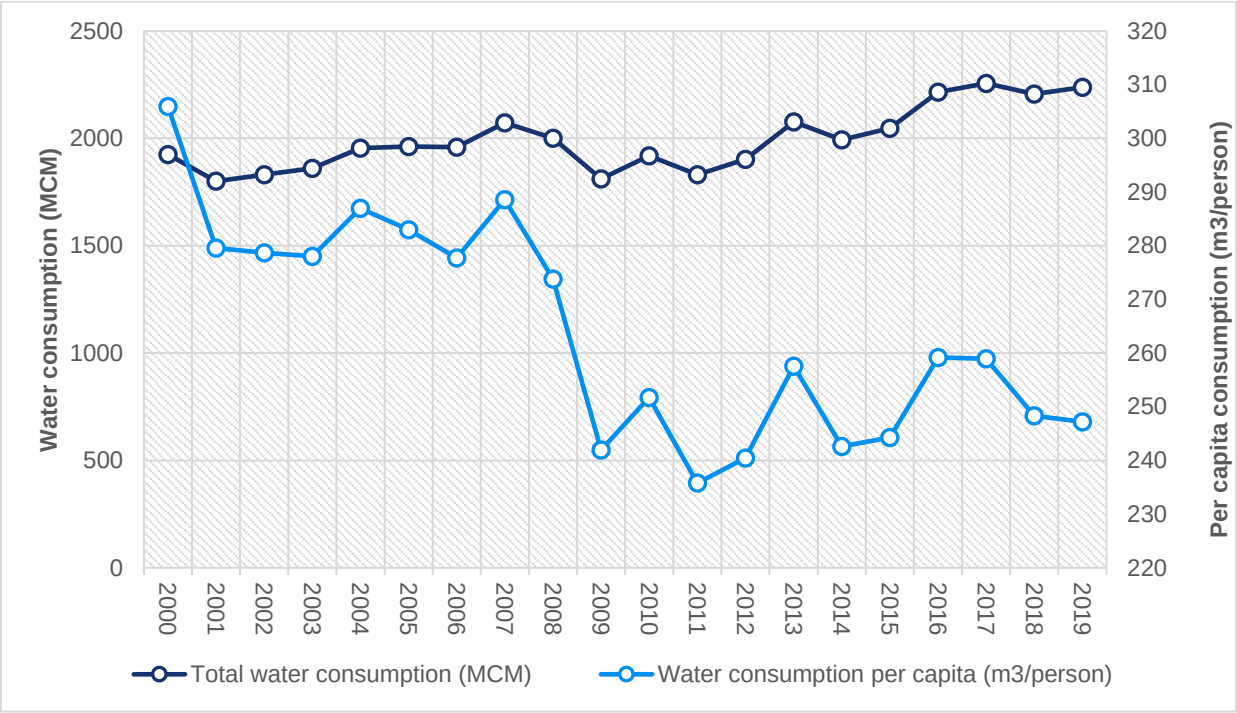


Water consumption

Total water consumption in Israel has increased by 16% over the period 2000-2019. Most of the increase is attributed to recent years – 9% between 2015 and 2019 alone. In contrast, water consumption per capita has declined: in 2019, water consumption per capita was 247 m^3, an improvement of 19% relative to per capita consumption of 306 m^3 in 2000. Between 2015 and 2019, per capita water consumption did not change significantly (by only 1%).[8] The increase in total water consumption is therefore attributed to the high population growth rate.

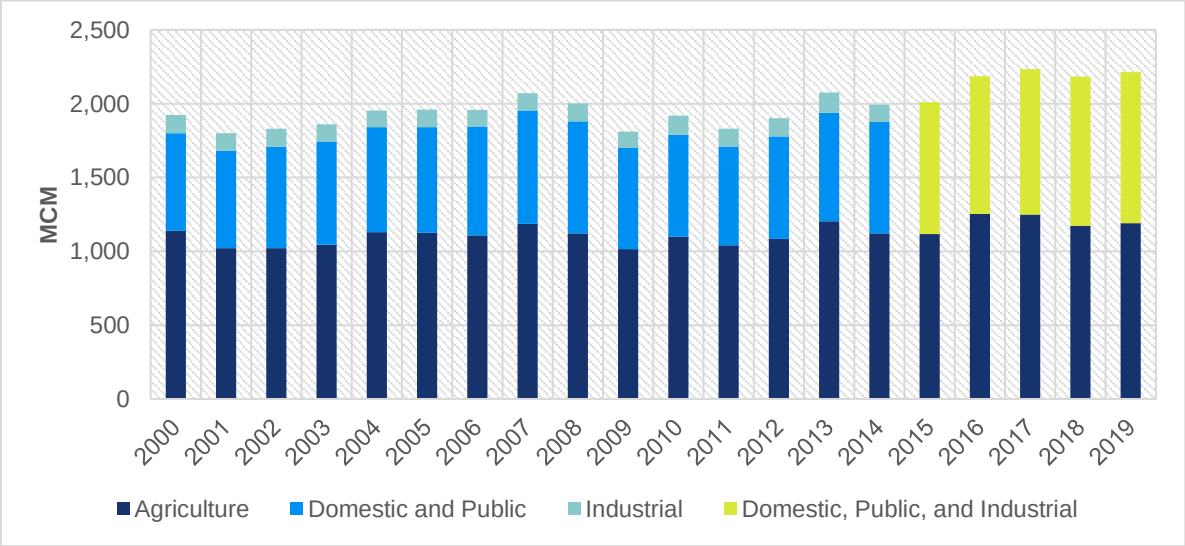
[7] Central Bureau of Statistics, 2020
[8] Central Bureau of Statistics, 2020

Figure 4: Total and per capita water consumption



In 2019, agriculture accounted for approximately 53% of the total water consumption; this proportion has remained relatively stable since 2000, as illustrated by the following graph.[9]

Figure 5: Total water consumption by usage (MCM)[10]



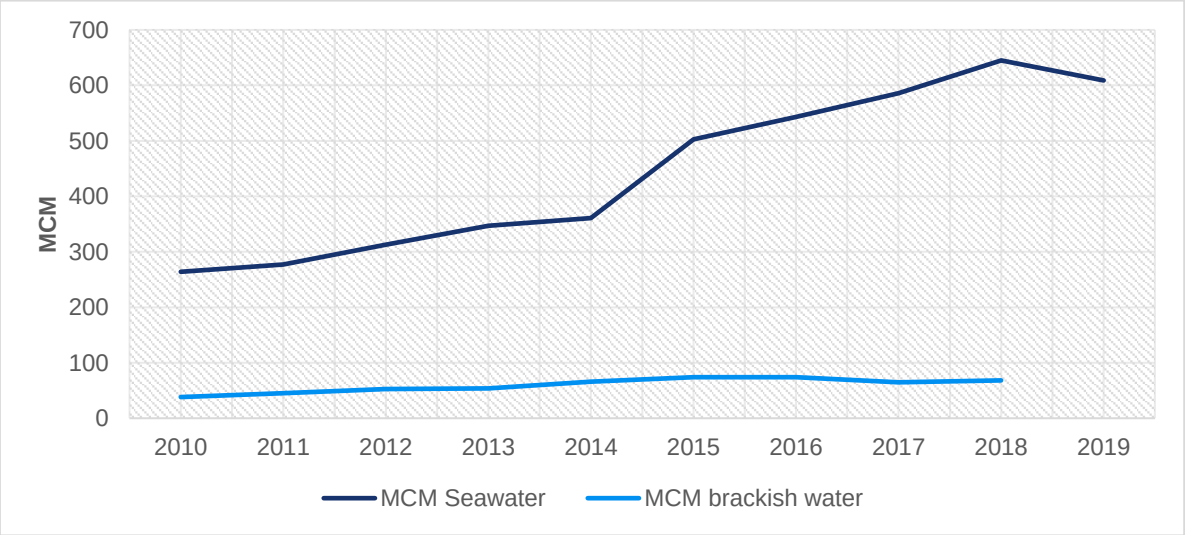
[9] Central Bureau of Statistics, 2020
[10] Central Bureau of Statistics, 2020

Water desalination[11]

Water scarcity in Israel has led to the development of advanced technologies for seawater and saline water desalination and wastewater treatment and recovery. Seawater desalination increased by 120% between 2010 and 2019, from 277 MCM to 609 MCM. There was a spike in the amount desalinated between 2014 and 2015, from 351 to 503 MCM – a 43% increase. From 2015 to 2018, desalination increased by 28%, to 645 MCM, then decreased by 5.6%, to 609 MCM in 2019.

As of 2019 there were five main seawater desalination facilities in Israel: Sorek (responsible for 28.6% of total desalination), Hadera (25.1%), Ashkelon (15.6%), Ashdod (15.4%) and Palmachim (15.4%). A few small facilities desalinate a combined total of less than 100 MCM of brackish water from the aquifer, for agricultural and industrial use.

Figure 6: Water desalination in Israel[12]

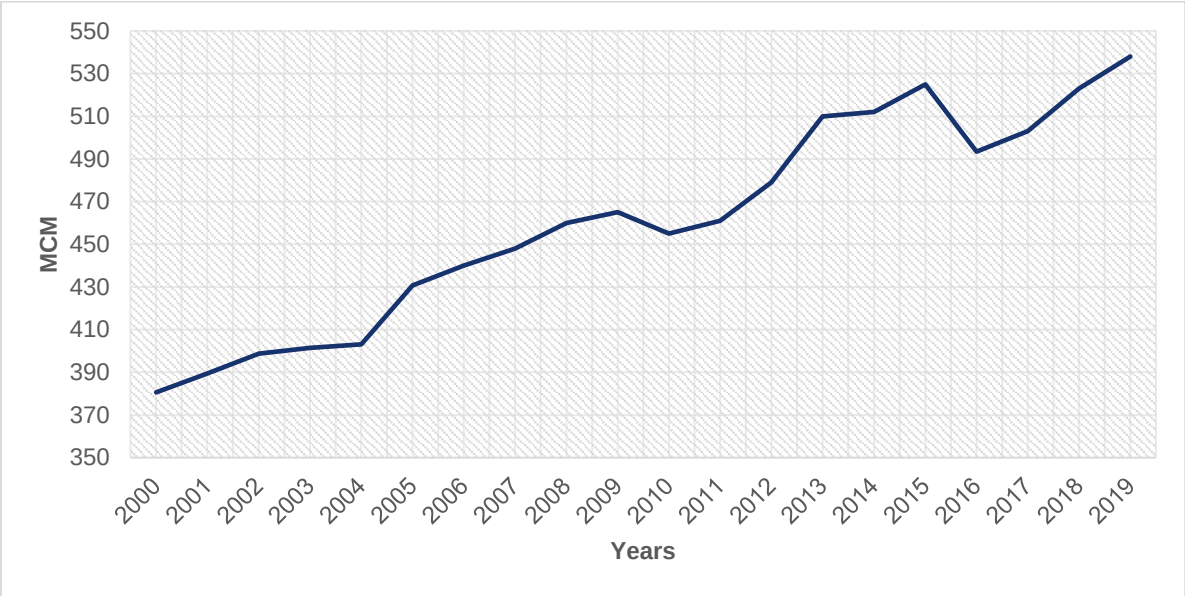


Wastewater recycling

Israel is a global leader in wastewater recycling. In 2019, 87% of domestic wastewater was recycled and used for agriculture and urban irrigation and landscaping - a 2% increase since 2015[13]. In the same year, 538 MCM of wastewater were treated, an increase of 41% from the 380 MCM treated in 2000. [14]

[11] Central Bureau of Statistics, 2020
[12] Central Bureau of Statistics, 2020, for 2019 there was lack of data for brackish water
[13] "Water-A Shared Responsibility", Ministry of Foreign Affairs, 2020
[14] Central Bureau of Statistics, 2020

Figure 7: Wastewater Treatment (MCM)



Climate profile

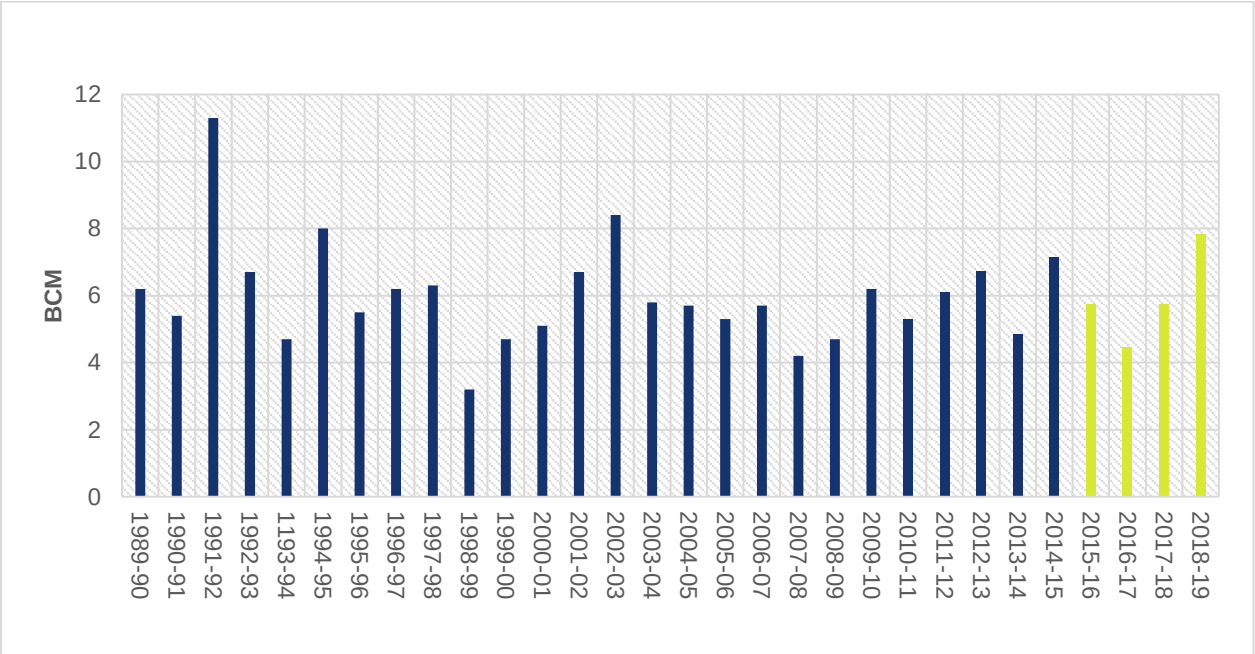
Israel lies in a transition zone between the hot and arid southern part of West Asia and the relatively cooler and wetter northern Mediterranean region. The northern part of Israel is characterized by a Mediterranean climate, while the southern part is arid, with a narrow, semi-arid strip in between. Israel's climate is characterized by hot summers and mild winters. Rainfall varies significantly across the country and from year to year.[15]

Rainfall

The most crucial component of Israel's climate is the rainfall regime. Changes in the rainfall regime, including annual quantity, number of rain spells, seasonal distribution, intensity and timing, all have significant impacts on the country's water resources.[16] Mean multi-annual rainfall is calculated for 30-year periods to adequately characterize the rainfall regime in accordance with the World Meteorological Organization (WMO) guidelines. In Israel, the most recent measurement period is 1981-2010. In this period the average annual rainfall volume was 6.11 BCM. Average annual rainfall during 2018-2019 was much higher, at 7.84 BCM. These years were characterized by a large number of rainy days and frequent rain showersFigure 7. However, the previous 3 years were characterized by a low average annual rainfall: 5.7 BCM in 2015-16, 4.5 BCM in 2016-17, and 5.7 BCM in 2017-18.[17]

[15] Central Bureau of Statistics, 2020
[16] Israeli Climate Change Information Center (ICCIC), 2014
[17] Central Bureau of Statistics, 2020)

Figure 8: Annual rainfall volume in Israel (BCM)

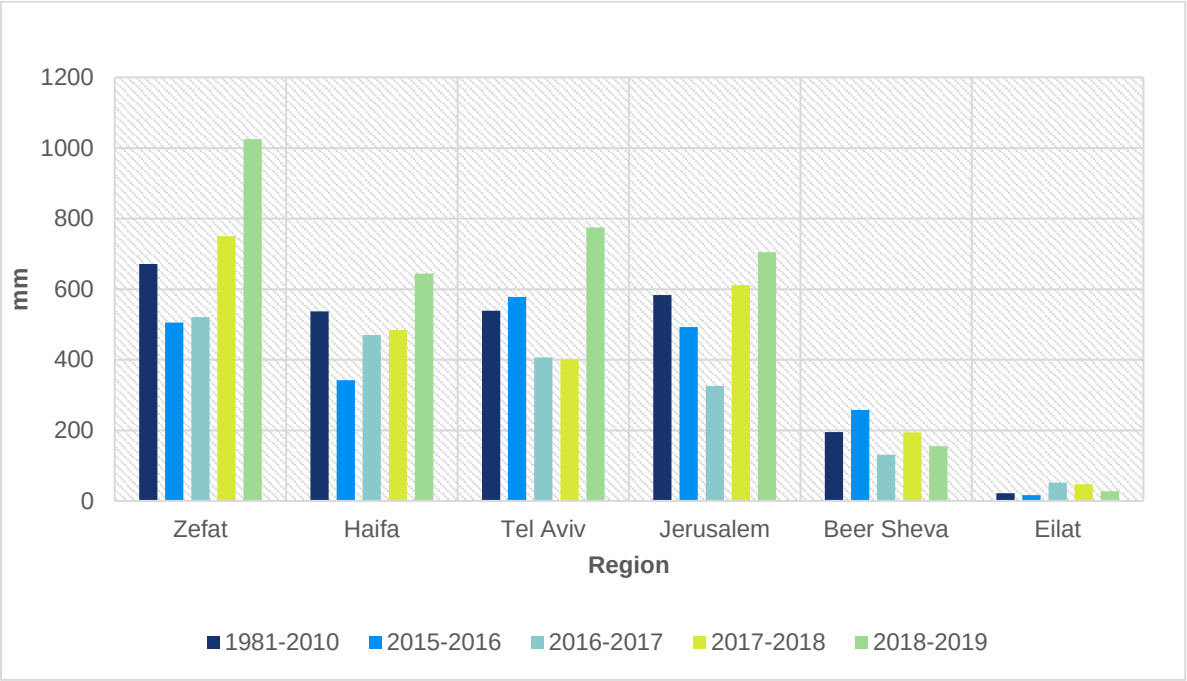


Mean multi-annual rainfall by locality is also calculated for the same 30-year period, 1981-2010. [18] [19] For elaboration on the geographic variation in mean multi-annual rainfall, see last National Communication Report, submitted in 2018.[20]

The graph below compares the mean annual rainfall by locality of the last 4 years (since the last report submitted) to the mean multi-annual rainfall by locality (1981-2010). While 2018-2019 was characterized by a large volume of rainfall in most regions, previous years were significantly dryer in most regions, with a low mean annual rainfall.[21]

[18] Israel Meterological Service, 2015
[19] Central Bureau of Statistics, 2020
[20] (Ministry of Environmental Protection, 2018)
[21] Central Bureau of Statistics, 2017-2020

Figure 9: Mean annual rainfall by region, compared to mean multi-annual rainfall (1981-2010)



Temperature

Although slightly lower than in the 1950s and 1960s (due to relatively high temperatures in those decades), the mean annual temperature has increased steadily since 1990.

Like precipitation, mean temperatures are also measured over long-term periods. The most up to date measurement period for mean local temperatures is 1995-2009, while the most up to date measurement period for mean national temperatures is 1961-1990. For elaboration see Israel's Third National Communication Report submitted to the UNFCCC in 2018.

The year 2019 was hotter than average - the seventh hottest year documented, with a mean daily temperature of 20.8°C, 1.3°C higher than the 1961-1990 average. 2018 was even hotter, with a mean daily temperature of 21.5°C, 2°C higher than the 1961-1990 average. The years 2010-2019 were the hottest since 1951.[22]

Extreme weather events

There have been several specific extreme weather events in Israel over the past few years.

December 2018 was characterized by large volumes of rainfall in the northern and central areas – 1.5 to 3 times higher than the historic average for the month, depending on the region. In one particular precipitation event more than 200mm of rainfall were measured in the coastal plain and lowlands, causing

[22] Central Bureau of Statistics, 2020

extensive floods.[23] In January 2020 three similar events occurred in different areas, causing several deaths due to flooding.[24]

In an extreme heat wave on July 17, 2019 temperatures measured in Sodom, in the Judean Desert, reached 49.9°C, the highest temperature measured in Israel since 1942.[25]

For a week in May 2020 an extreme heat wave struck Israel. While it did not break any existing national records, at times temperatures reached over 40 degrees Celsius. This wave was notable because of its timing (in the spring), length (a whole week) and sequence of high temperatures measured.[26] Climate scientists understand that heat waves have become more prevalent in Israel due to climate change – in the 21st century, periods of greater than three consecutive days when the temperature is at least six degrees above average have become much more frequent.[27]

Population profile

Population changes and growth

Population changes and growth patterns are fundamental drivers of trends in energy consumption, land use, housing density, and transportation, all of which have a significant impact on GHG emissions. In 2018, approximately 90% of the Israeli population lived in urban localities, which is consistent with the data from previous years. From 2000-2014, the percentage of the population in urban areas hovered between 92% and 93%; from 2015 onward, the figure has remained constant at approximately 90%.

Israel's population has risen steadily since 2000, reaching 9.05 million in 2019 (yearly average), as seen in the figure presented below.[28]

The annual growth rate during 2000-2019 was 1.95%, of which approximately 18% originated from net immigration.[29] This annual growth rate is the highest among OECD countries, which averaged an annual population growth rate of 0.68% over the same period.[30]

[23] Central Bureau of Statistics, 2020
[24] IMS, 2020 Israel Meteorological Service
[25] Central Bureau of Statistics, 2020
[26] Porat, 2020
[27] Ministry of Environmental Protection, 2020
[28] Central Bureau of Statistics, 2020
[29] Central Bureau of Statistics, 2020
[30] World Bank, 2020

Figure 10: Population of Israel (thousands) (2000-2019), CBS 2.14 2020

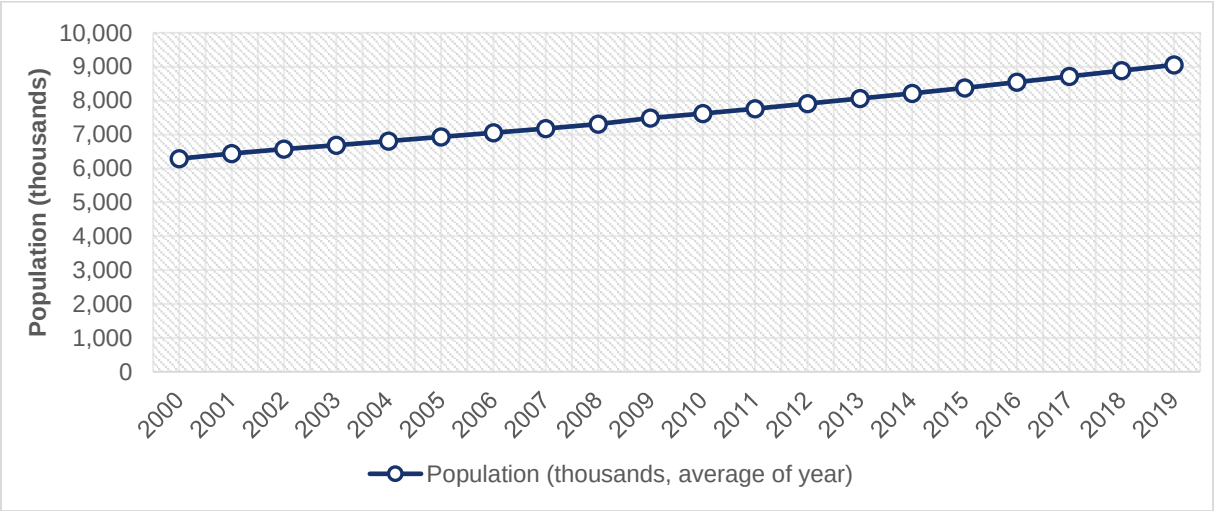
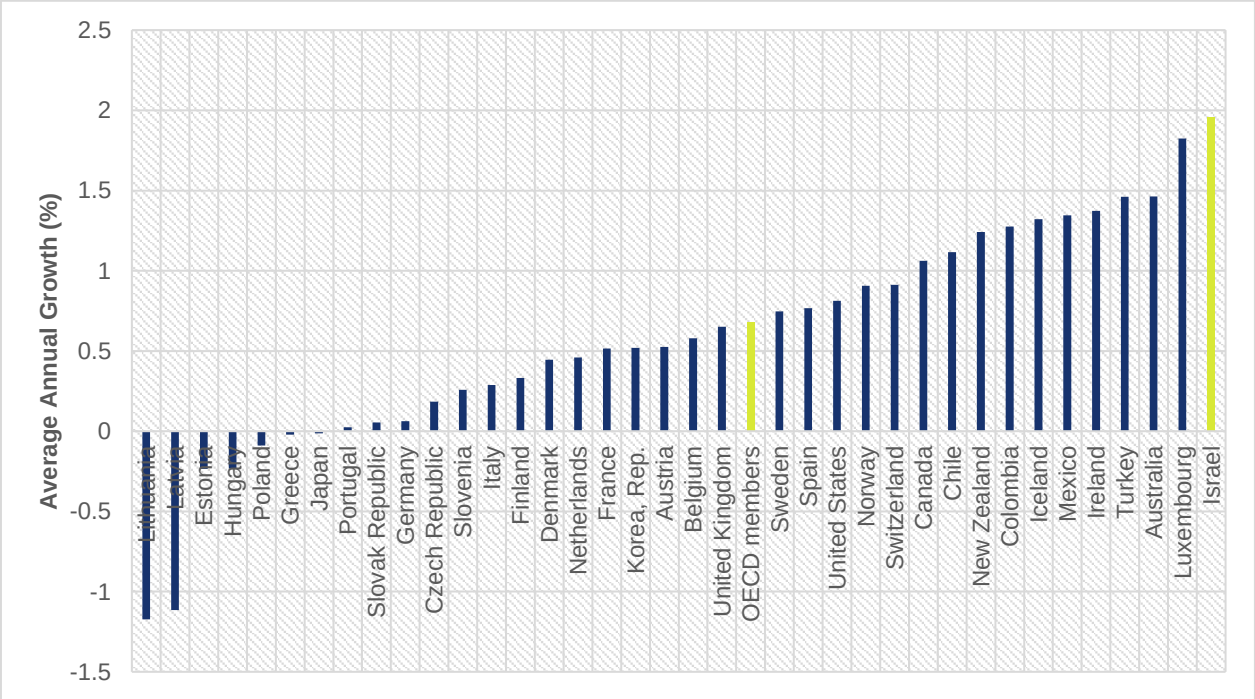


Figure 11: Annual growth rate- comparison to OECD countries (2000-2019), The World Bank World Development Indicators 2020



Density

Israel's population density has increased steadily, from 278.7 people per km^2 in 2000 to 398 people per km^2 in 2019.

The population density varies greatly by region. The Southern and Northern districts are the least dense, with 91.8 and 323.7 people per km^2, respectively. The Tel Aviv district is by far the most dense, with 8,444

people per km^2. Together, the Tel Aviv and Central districts represent less than 7% of the country's land mass, but host 43% of its population.[31]

Table 3: Density per km^2, CBS 2.23 2020 (Percentage may not sum to 100% due to rounding).

Districts	2000			2016			2018		
	% of total population	total area (sq.km)	density per sq.km	% of total population	total area (sq.km)	density per sq.km	% of total population	total area (sq.km)	density per sq.km
Central district	23%	1276	1,142.4	25%	1294	1,635.1	26%	1294	1,697.1
Tel Aviv district	18%	171	6,747.2	16%	172	8,072.1	17%	172	8,297.5
Jerusalem district	12%	652	1,163.0	13%	653	1,659.0	13%	653	1,736.1
Haifa district	13%	863	948.4	12%	866	1,150.5	12%	866	1,192.6
Northern district	17%	4,478	241.9	17%	4473	313.3	17%	4473	323.7
Southern district	14%	14,233	63.2	15%	14185	87.7	15%	14185	91.8

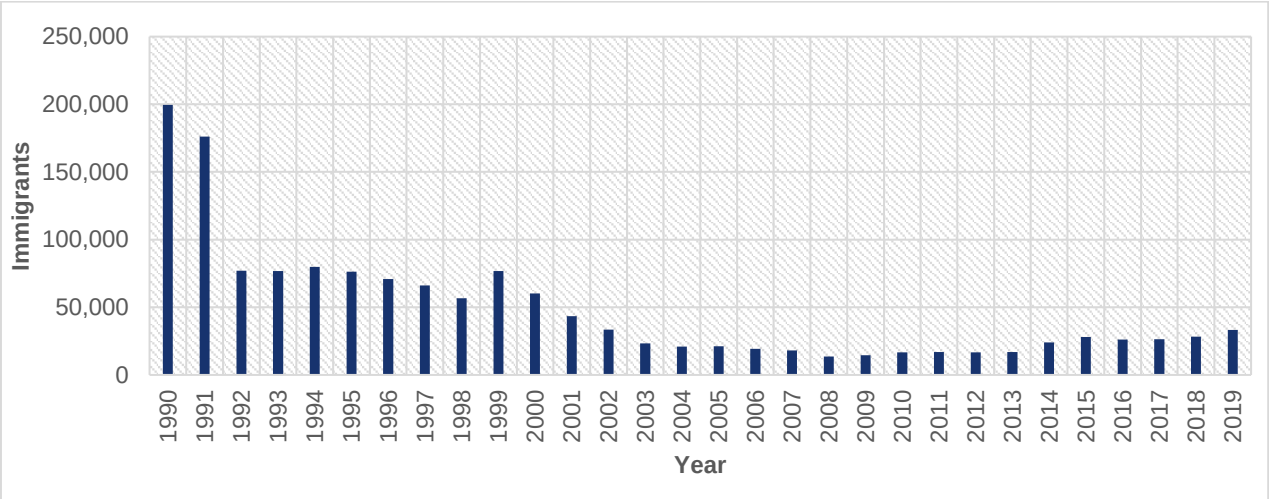
Immigration

Since its establishment, 3.3 million immigrants have arrived in Israel, nearly 45% since 1990. In this year there was a peak in immigration (200,000 immigrants, mostly from the USSR) and since then immigration decreased to a minimum of only 13,701 immigrants in 2008. Immigration has since moderately increased, to 33,200 immigrants in 2019.

Between 2016 and 2019, a total of 113,831 immigrants have arrived in Israel. The average annual immigration in this period was 28,458 people.

[31] Central Bureau of Statistics, 2020, Table 2.23

Figure 12: Immigration to Israel (1990-2019), CBS 2.53, 2020



Economic profile[32]

Until the end of 2019, thanks to cautious monetary, financial, and fiscal policies, economic growth exceeded that of most other OECD countries for more than a decade. Employment was rising, inflation was low, the external surplus was reasonable, and the public finances were in relatively good shape.

However, the COVID-19 pandemic which began in early 2020 has had profound effects. Lockdown measures and high uncertainty have led to a sharp contraction in output. More than a million workers were put on leave, unwinding some of the employment gains of the past.

Israel's GDP declined by 2.2% in 2020 compared to 2019.[33] Nonetheless, the long-term impacts of the COVID-19 pandemic on economic growth are not yet fully known and will be reflected in the next report.

Economic growth and changes in the overall GDP

Despite the economic crisis of 2008-2009, when GDP growth fell to just 1.3% in 2009, Israel's economic growth has continued to be strong. There was an average annual growth of approximately 4% over the 2010-2019 period. Israel's economic growth exceeded that of all OECD countries (with an average of 2.3%), except for Turkey. However, per capita GDP growth (2.0% in 2010-2019) was just slightly above the average of all OECD countries, 1.4%.[34]

Due to the COVID-19 pandemic, the GDP/capita decreased by 3.9% between 2019 and 2020.

[32] (OECD, 2020)
[33] Central Bureau of Statistics, 2021
[34] World Bank, 2020

Figure 13: Trends in per capita and real GDP (2015 prices), CBS 11.2, 2021

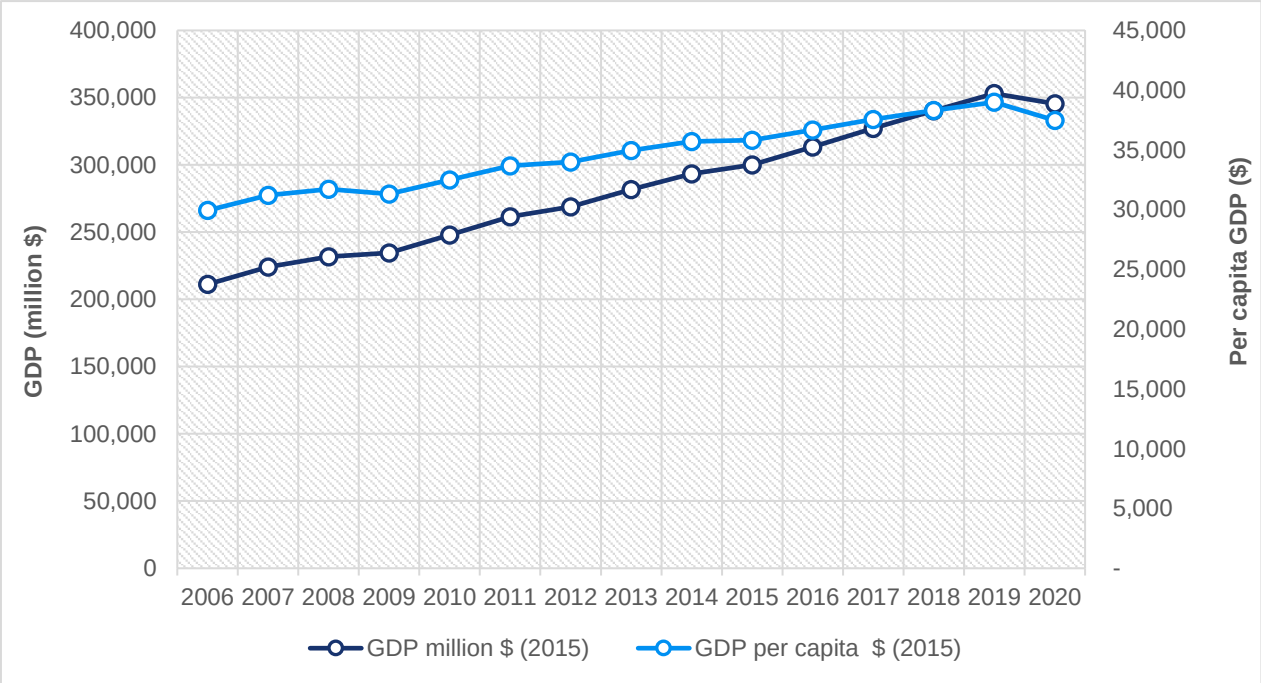


Figure 14: GDP average growth rate, OECD (2010-2019), The World Bank World Development Indicators, 2020

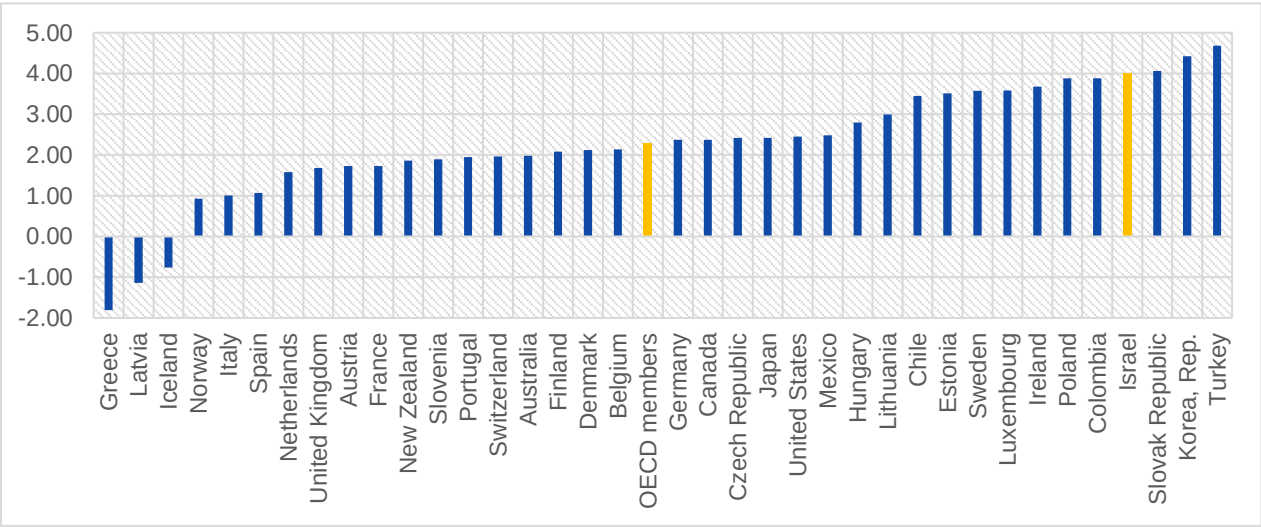
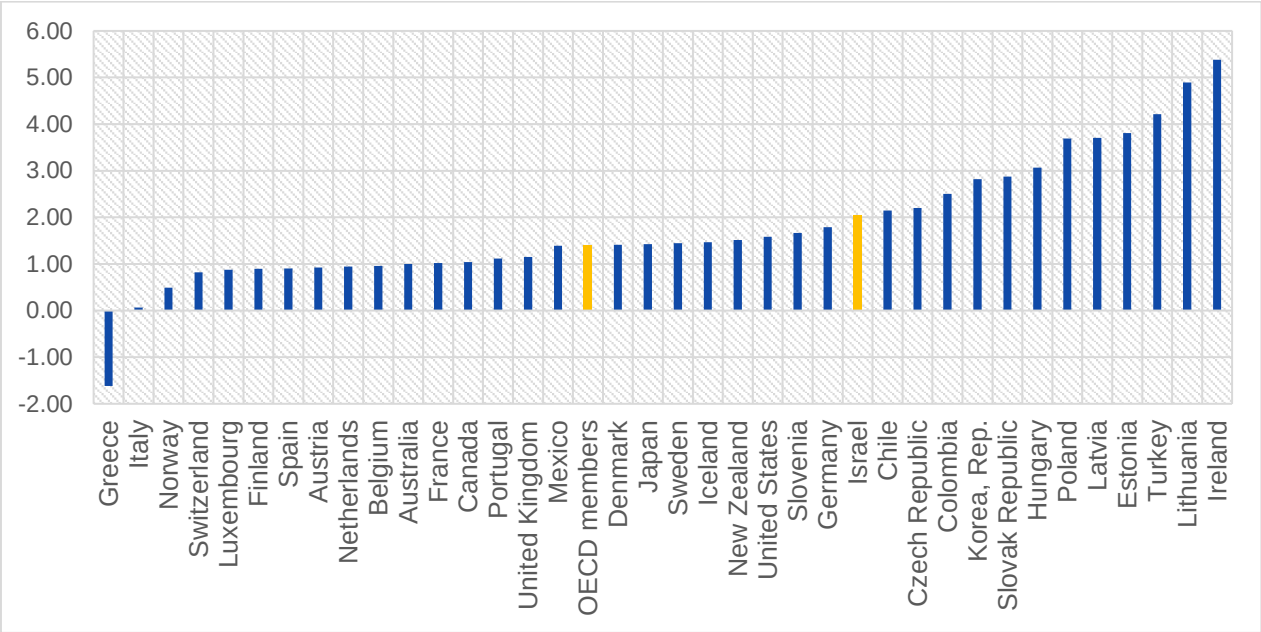


Figure 15: GDP per capita growth rate, 2010-2019, The World Bank World Development Indicators, 2020



Development of economic sectors[35]

The share of gross domestic product (GDP) of most sectors remained largely unchanged during 2015-2019. Changes to key sectors in terms of climate change included:

- Manufacturing, mining, quarrying and construction declined from 15% of GDP in 2015 to 13% in 2019.
- Electricity and water supply, sewage, and waste management remained steady at around 2% from 2015-2019.
- Transportation, storage, postal and courier activities remained steady at around 4% from 2015-2019.
- Agriculture, forestry and fishing remained steady at around 1% from 2015-2019.

Industry

During Israel's first decade (1948-1958), the country's industrial base consisted of textile manufacturing, diamonds and food processing. In subsequent decades, industrial production increased with the development of chemical, metallurgical, and electronics industries.

Israel has few raw natural resources; as such, the majority of its industries have concentrated on manufacturing products with a high added value. Major industries include pharmaceuticals, electronics, agro-technology, telecommunications, fine chemicals and computers. Other industries include cement

[35] Development of economic sectors was measured in terms of domestic product (DP) in the last National Communication Report, however in this report development is measured in terms of GDP due to changes in the manner of documentation by Israel's Central Bureau of Statistics.

manufacturing, nitric acid production, lime manufacturing, as well as those that consume soda ash, such as glass and paper production industries.

Manufacturing Industry[36]

The manufacturing industry (including high-tech industry) accounted for nearly 13.5% of GDP (at 2015 prices) and 10% of the workforce in 2019.

This represents a decline over the last decade: the share of GDP has declined by approximately 3.5% from nearly 17% in 2010 and by 1% from 14.5% in 2015; the share in the workforce has declined by 4% from 14% in 2010 and by 2% from 12% in 2015. The high-tech sector accounted for 27% of the manufacturing industry jobs in 2019, remaining relatively steady since 2010.

Nonetheless, the high-tech industry, which is skill and capital intensive and requires sophisticated production techniques, continues to attract considerable investment in research and development. In 2018, 30% of the business R&D expenditure was attributed to the industrial high-tech sector (9% increase from 2015).

Figure 16: Manufacturing sector's share of GDP, 2010-2019 (2015 prices)

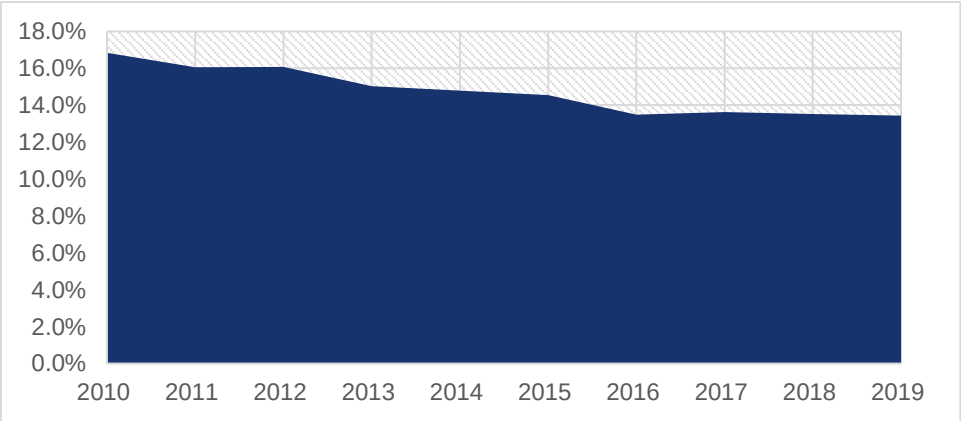
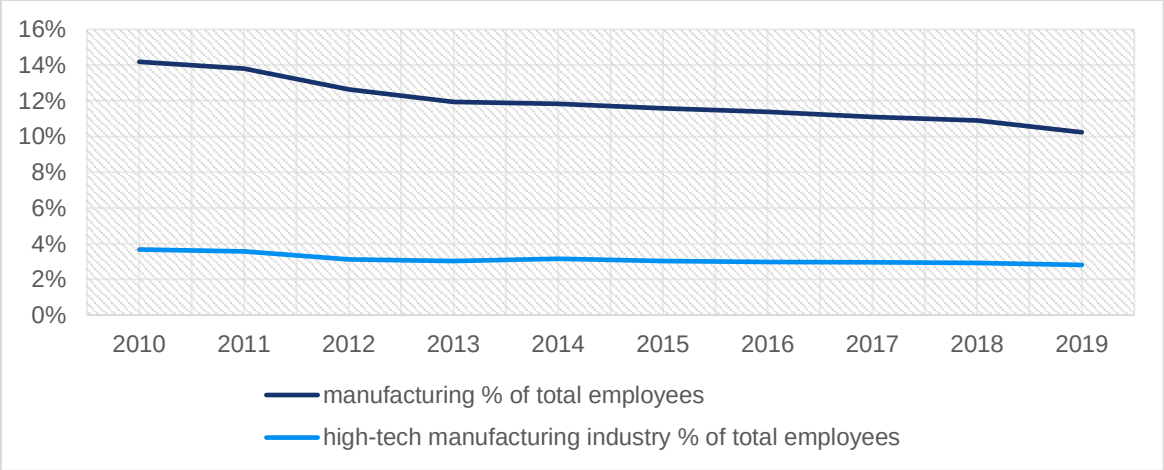


Figure 17: Manufacturing sector and high-tech industry's share of the workforce, 2010-2019



[36] Central Bureau of Statistics, 2020

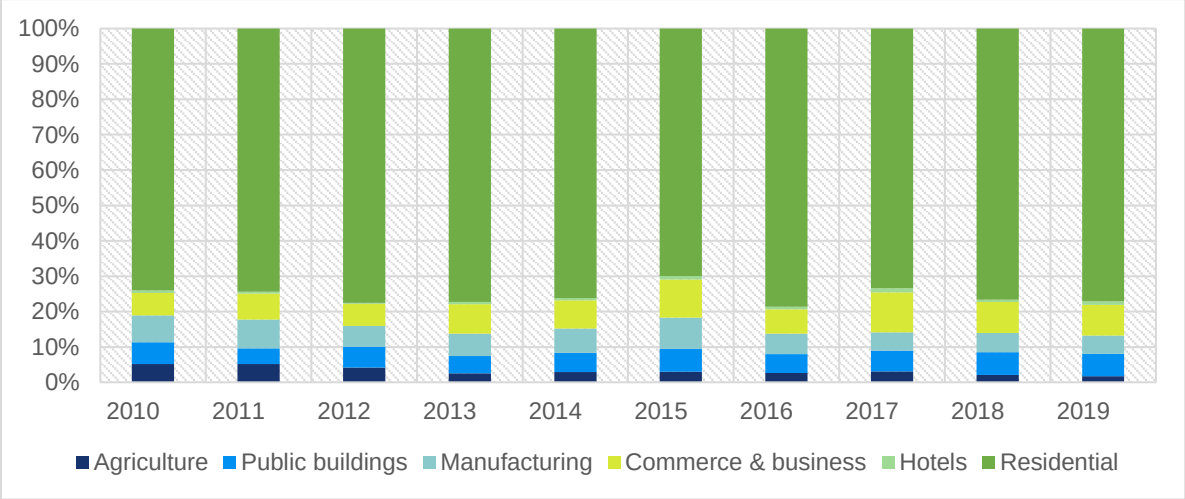
Building stock and urban construction[37]

The contribution of construction to Israel's net GDP was 6.5% in 2019, compared to 5.9% in 2015 and 5.4% in 2010. In 2019, construction accounted for 7% of the workforce. Additionally, the average construction wages rose nearly 15% (in current prices) between 2011 and 2019.

Residential construction accounts for the majority (77%) of construction completed in 2019. Manufacturing and storage (5%), offices (4%), and education (4%) are the sectors which represent the next largest shares of new construction. Agricultural construction (2%) and manufacturing and construction (5%) have declined since 2010, when they represented 5% and 8% of new construction, respectively.

Israel continues to experience increasing prices in the housing market: the apartment price index rose by 12% and the rent index rose by 6% over the 2015-2019 period. This is due in part to a housing shortage, resulting from a combination of insufficient construction during the previous decades, and an increasing number of households due to population growth.[38] To address the high prices and housing shortfall, residential construction has started to increase significantly in the last few years, with governmental encouragement, and is expected to increase further over the coming decades.

Figure 18: Share of Completed Construction, CBS 20.6, 2020



Agriculture[39] [40]

In 2019, agriculture accounted for 1.0% of the workforce, remaining steady since 2016 and decreasing from 1.6% in 2010. Agriculture's share of the GDP was 1.2% in 2019, a decrease from 1.4% in 2016 and from 1.7% in 2010.

Total land area under agricultural cultivation was 2,883 thousand dunams in 2019, a 4% decrease from 3,086 thousand dunams in 2016 and a 2% increase from 2,832 thousand dunams in 2010.

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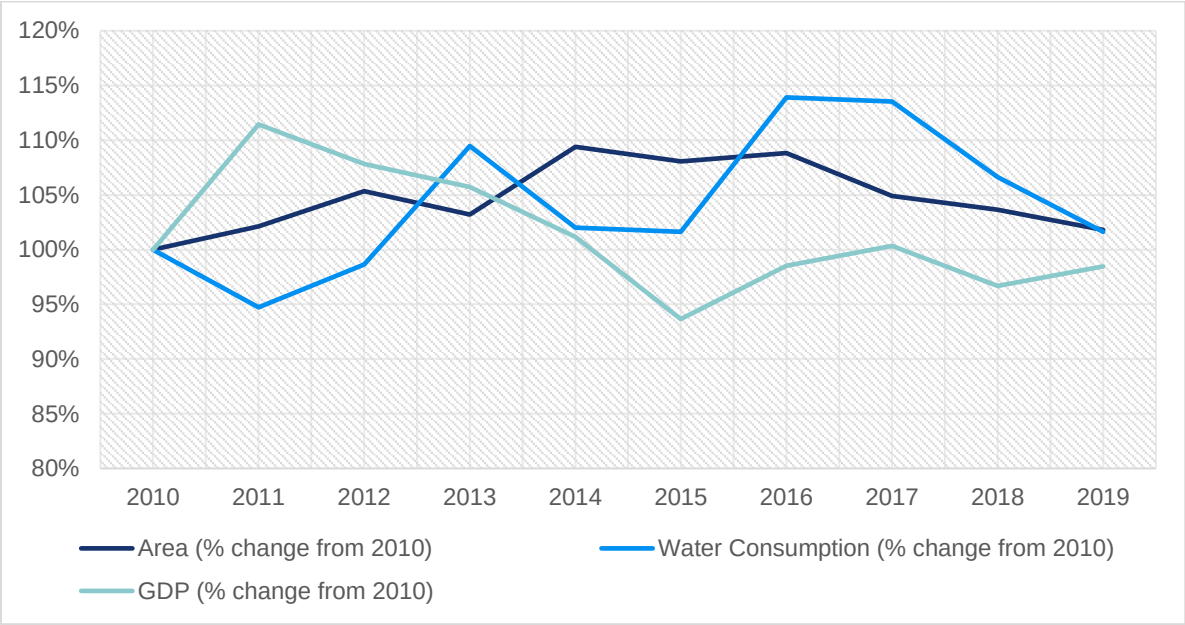
[37] Central Bureau of Statistics, 2020
[38] State Comptroller, 2014
[39] Central Bureau of Statistics, 2020, table 21.1
[40] Central Bureau of Statistics, 2020, table 23.6

In 2019, agriculture consumed approximately 53% of Israel's total water consumption, using 1,191 MCM of water. This usage represents a 7% increase in water consumption from 2015, when 1,118 MCM of water was used for agriculture.

Figure 19: Major indices in agriculture, 2010-2010 [% change from 2010]



Energy profile[41]

Israel's total primary energy supply in 2019 was 23,287 thousand TOE, a 1.9% increase from 2016 (22,846 thousand TOE) and an increase of 2.9% from 2010 (22,636 thousand TOE). In 2020, total primary energy supply decreased by 3.2% relative to 2019, to 22,532 thousand TOE, primarily due to a 10% decrease in supply of petroleum - used almost exclusively in transport – due to COVID-19 lockdown measures; as such, 2010-2019 is more indicative of the long-term trends and Israel's overall energy profile.

Energy intensity improved significantly during 2000-2019, both in terms of per capita consumption and in terms of energy consumption per unit of GDP:

1. Final total energy consumption per capita decreased by 13%, from 2.04 TOE per capita in 2000 to 1.77 TOE per capita in 2015, and then decreased by an additional 9% to 1.61 TOE per capita in 2019.
2. Energy consumption per economic output improved by 29%, from 27.04 TOE per million NIS GDP in 2000 to 19.32 TOE per million NIS GDP in 2015, and then improved by additional 8% to 17.34 TOE per million NIS GDP in 2017. This data may indicate uptake of energy efficiency improvements in the various economic sectors, however, it may also indicate an increase in the share of non-energy-intensive industries in the GDP, i.e. a shift from the manufacturing industries to the services industries.
3. The Israeli energy production sector continues to undergo two major changes:

[41] Central Bureau of Statistics, 2020

- Independent Power Producers (IPPs) continue to enter the market. In 2019, 33.9% of electricity was generated by IPPs, up from 21.3% in 2015.[42]
- The discovery of natural gas reserves has significantly changed the energy generation fuel mix.

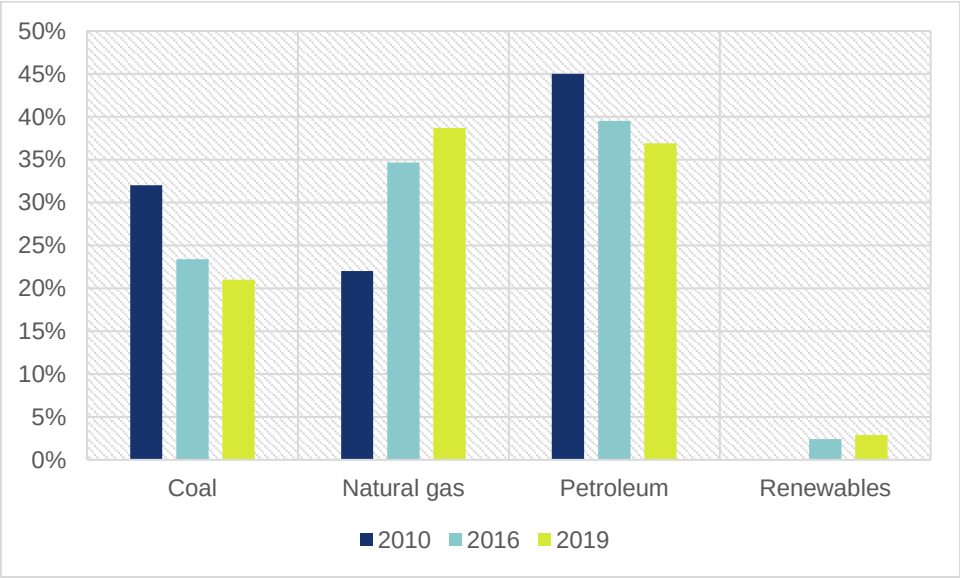
Energy supply (production and reserves)

Fuel mix

An increased uptake of natural gas has been the main trend in the country's total fossil fuel mix (primary energy), both in the power generation and manufacturing/large-scale commercial sectors.

The share of natural gas in total primary energy consumption rose from approximately 22% in 2010 to 35% in 2016, and then to 39% in 2019. The share of coal has decreased from approximately 32% in 2010 to 23% in 2016, and then to 21% in 2019. The share of petroleum fuels has decreased from approximately 45% in 2010 to 40% in 2016, and then to 37% in 2019. The share of renewables increased from nearly zero in 2010 to 2% in 2016 and then to 4.9% in 2019.[43]

Figure 20: Fuel mix (% of primary energy)



Coal

Coal was introduced during the early 1980s to diversify energy resources and became a major fuel in electricity production; it is used almost exclusively for electricity generation purposes by the state-owned Israel Electric Corporation (IEC). Israel has no domestic coal supply and relies on coal that is imported solely by the National Coal Supply Company.

[42] Central Bureau of Statistics, 2021
[43] Central Bureau of Statistics, 2020, 11.2.21

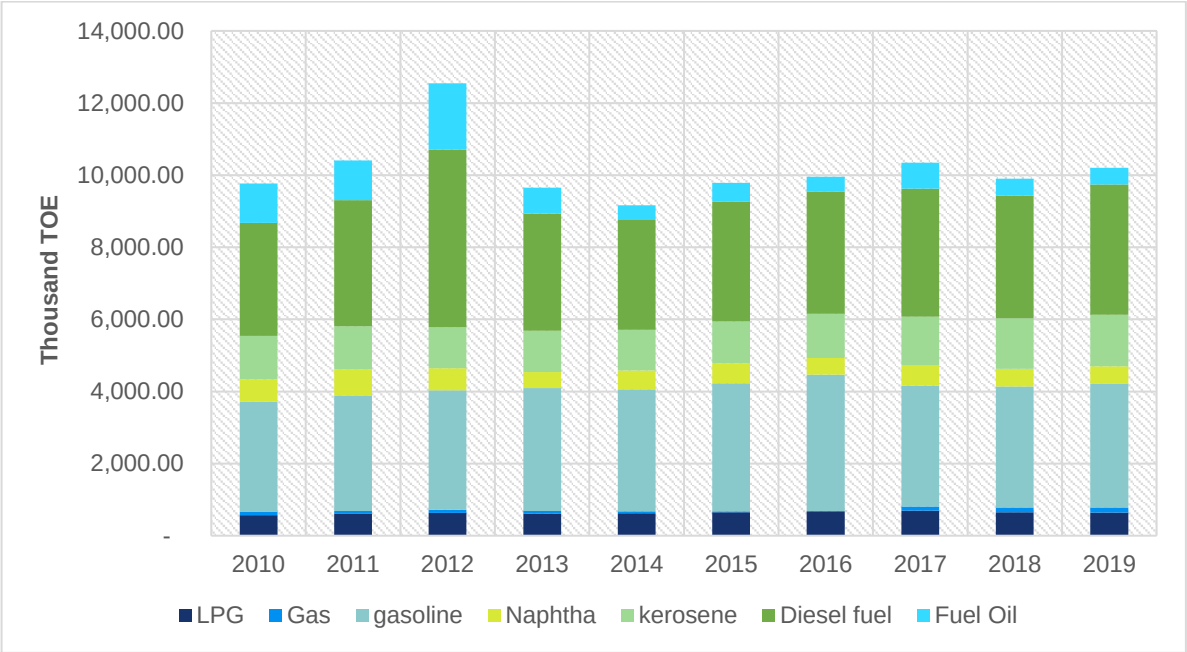
Petroleum-based fuels

Israel has negligible domestic crude oil extraction (85.7 thousand TOE in 2019) and either imports raw petroleum to refine most of the fuel products it requires, or imports ready- made fuel products.

Israel has two major oil refineries with a total refining capacity of about 15 million tons per year: Oil Refineries Ltd (ORL) in Haifa with a maximum crude oil refining capacity of approximately 9.8 million tons of crude oil per year, and the Paz Refinery in Ashdod.

Diesel fuel and petrol constitute the bulk – nearly 70% - of total petroleum-based fuel consumption. Petrol accounted for 34% in 2019, down from 38% in 2016, and up from 31% in 2010. Diesel fuel accounted for 35% of total consumption in 2019, up from 34% in 2016, and from 32% in 2010. The share of fuel oil decreased from 11% in 2010 to 4% in 2016 and to 2% in 2019, reflecting a trend of conversion to natural gas in industry.

Figure 21: Petroleum products consumption (TOE) 2010-2019



Natural gas

In recent years, offshore natural gas reserves totaling an estimated 900 BCM (proven and contingent) have been discovered. These are expected to have major ramifications for the Israeli market.

These reserves, specifically the Tamar and Leviathan fields, are of very high quality (over 99% methane) and significantly large enough to supply the domestic market for the coming decades. In 2013, the Tamar field began producing gas for Israeli consumption and natural gas consumption increased. At the end of 2019 the Leviathan field began supplying large amounts of gas to the transmission system, so that Israel is currently experiencing a redundancy in natural gas supply enabling exports to neighboring countries, as well as increased competition in the market. [44]

[44] Natural Gas Authority, Ministry of Energy, 2019

The first gas exports from Israel began at the end of 2016, with the start of the gas supply from the Tamar reserve, to the Arab Potash and Jordan Bromine plants on the Jordanian side of the Dead Sea. In addition, in September 2016, the Leviathan ownership group signed an agreement with the Jordanian Power Company (NEPCO) for the supply of natural gas in a total amount of approximately 45 BCM, for a period of 15 years. In early 2018, the Tamar ownership group signed an agreement for the supply of natural gas with the Egyptian company Dolphinus Holdings, based on the excess gas quantities that would be available to Tamar's partners over a period of 7 years from the date of commencement. The agreement set a minimum cumulative quantity for supply of 5 BCM, over the first three years. This agreement depends on the existence of an infrastructural solution which will enable gas transport to Egypt.[45]

In 2019, another two export agreements were signed with Egypt, allowing the export of a total of 83 BCM from Leviathan and Tamar reservoirs for a 15-year period.[46]

The development of additional fields - Karish and Tanin - is now in progress and they are expected to begin supplying the Israeli market by late 2022.

Natural gas supply to the Israeli market, as well as for export, totaled 11.28 BCM in 2019, an increase of around 17% relative to the 9.66 BCM supplied to the market in 2016, and an increase of 111% from approximately 5.4 BCM in 2010. Domestic extraction of natural gas accounted for approximately 93% of the total supply in 2019, a drastic increase from 60% in 2010, but a slight decrease from 96% in 2016.[47]

The power sector accounted for approximately 78% of natural gas consumption in 2019. Although power sector consumption grew by 82% over the 2010-2019 period, this period is also characterized by a significant uptake of natural gas in the industrial and large-scale commercial sectors, which grew by some 400% to approximately 22% of total consumption.[48]

[45] Delek Drilling
[46] Ministry of Energy, 2019
[47] Natural Gas Authority, Ministry of Energy, 2019
[48] Central Bureau of Statistics, 2020

Figure 22: Natural gas supply from extraction and imports, Developments in the Natural gas market review, Natural Gas Authority, 2020

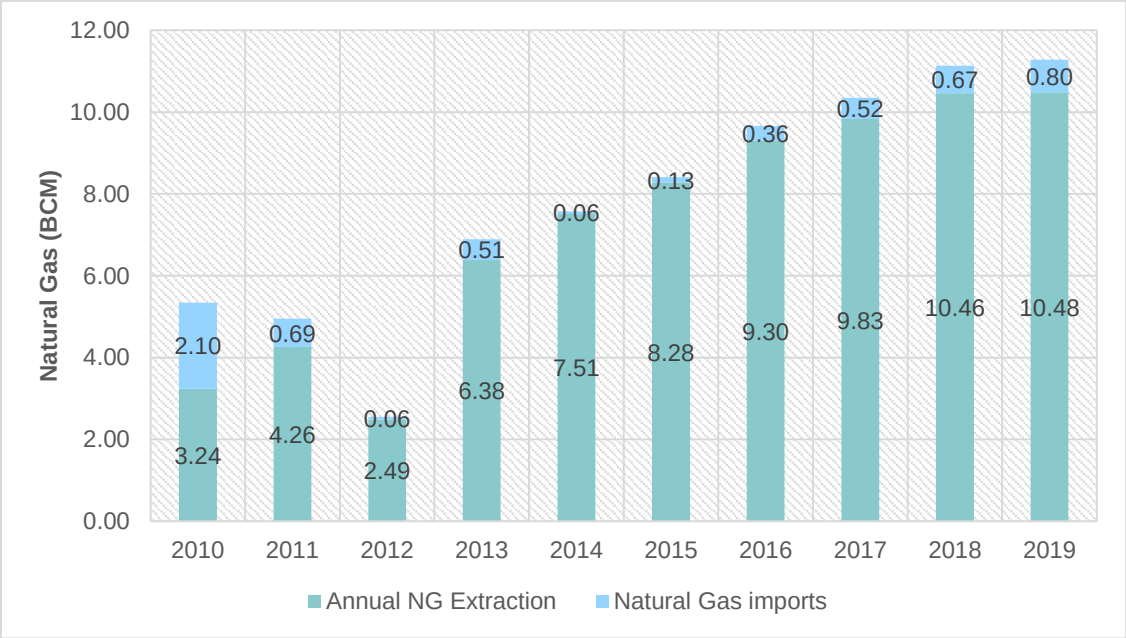
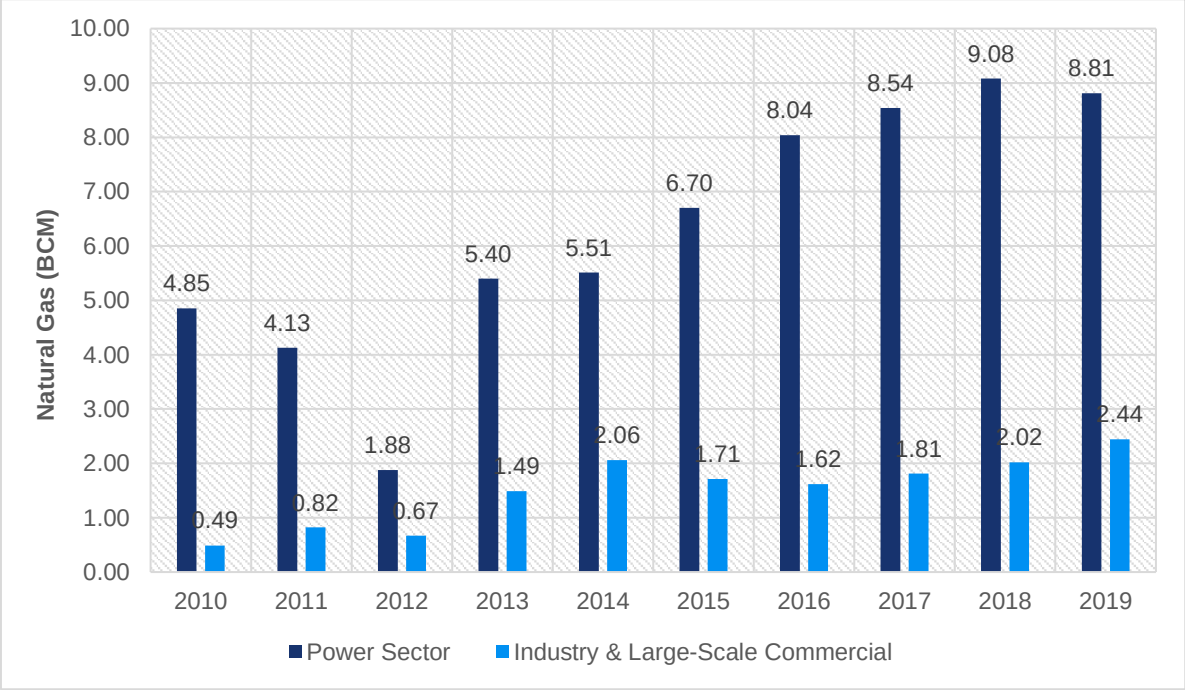


Figure 23: Natural gas consumption, Developments in the Natural gas market review, Natural gas authority, 2020



Renewable energy

In Israel, renewable energy policy is focused on increasing renewable electricity generation. In 2019, renewable generation accounted for 4.7% of electricity production, 6.1% in 2020, and 8.2% in 2021.[49] For more information, see power sector below.

Furthermore, solar energy is a major source of power for residential water heating, as per a long-standing regulation that mandates installation of solar water heaters on all new constructed residential buildings up to nine stories. In 2019, 419 thousand TOE of solar energy was utilized for water heating purposes. This accounted for 61% of the total renewable energy production in Israel.[50]

Power sector

Market structure

Historically, the state-owned Israel Electric Corporation (IEC) had a full monopoly on the power sector, including generation, transmission and distribution, and grid management.

In recent years, however, the Israeli electricity market has undergone extensive reform, including measures to increase competition in the electricity sector, resulting in a privatized generation component.[51]

By the end of 2019, the established electricity generation capacity owned by private producers and connected to the national electricity grid accounted for about 34% of total electricity generation in the country, and for 28% of the installed capacity. The Israel Electricity Authority (EA) estimates that by 2025 around 60% of the electricity generation and approximately 55% of the installed capacity will be private. [52]

In addition, grid management is handled by a new governmental company, while the supply component is expected to be opened for competition in the future. [53]

The transmission and distribution segments, however, continue to be managed mainly by the IEC and are expected to remain so in the future.

Generation capacity

At the end of 2019, installed generating capacity totaled 19,493 MW, representing a 17% increase from the 16,694 MW generation capacity in 2016.[54]

Generation fuel mix[55]

In 2020, approximately 26% of total power generated was from coal, down from 30% in 2019, 36% in 2016 and 59% in 2010. Natural gas provided 68% percent, up from 64% in 2019, 61% in 2016 and 39% in 2010. In

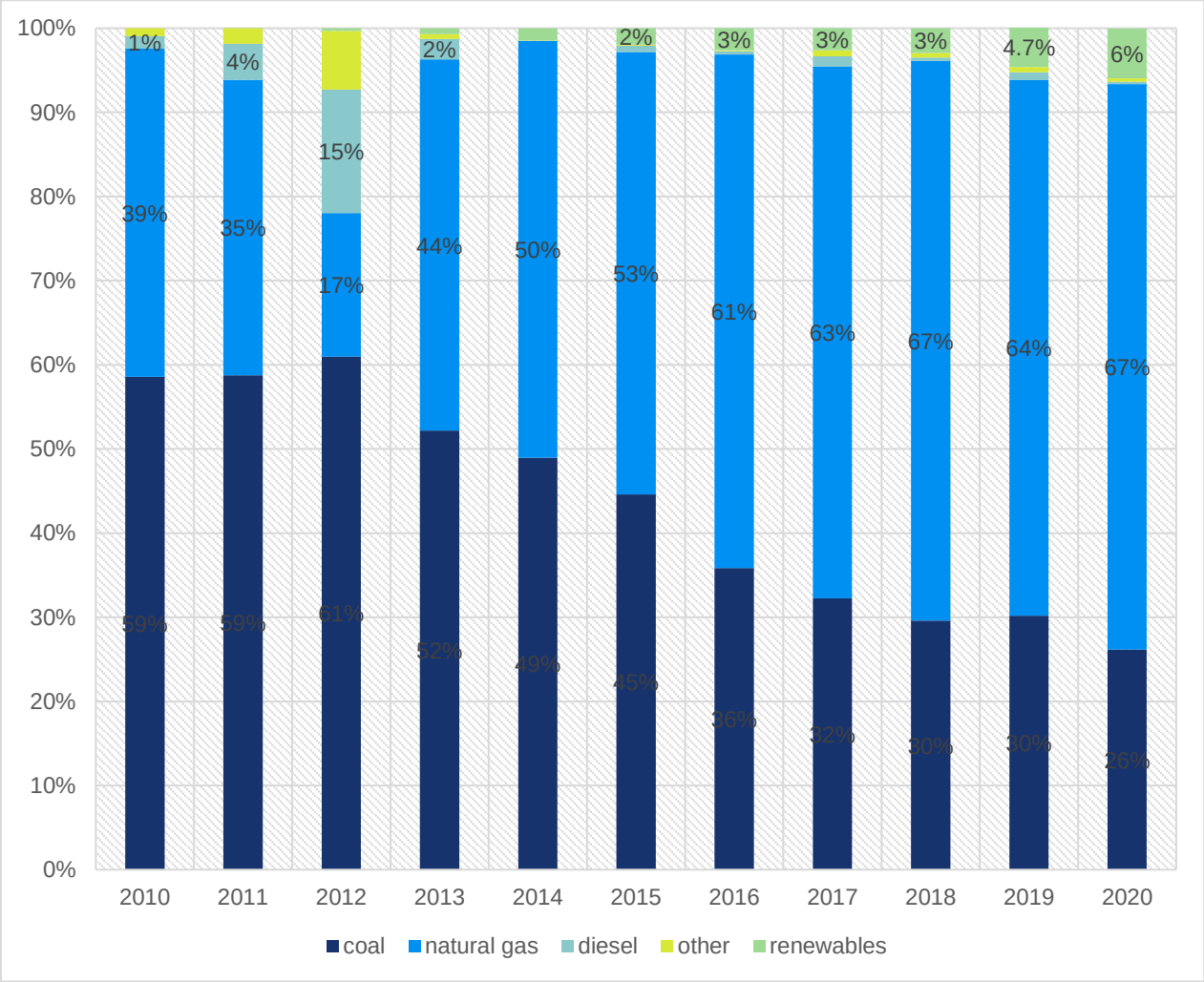
[49] Israel Electricity Authority, 2021
[50] Central Bureau of Statistics, 2021
[51] Ministry of Energy, 2019
[52] Israel Electricity Authority, 2020
[53] (Ministry of Energy, 2019)
[54] Central Bureau of Statistics, 2020, table 24.3
[55] Israel Electricity Authority, 2020

2021, 8.2% of electricity was generated from renewables, up from 6.0% in 2020, 4.7% in 2019, 2.6% in 2016 and from nearly zero in 2010.

Electricity consumption increased from approximately 54 TWh in 2010 to approximately 61 TWh in 2016 and to 67.1 TWh in 2020, representing an average annual growth rate of 3%. Peak demand increased from 10.1 GWh in 2010 to 12.4 GWh in 2016 to 13.3 GWh in 2019, amounting to an average annual growth of 3.3%.

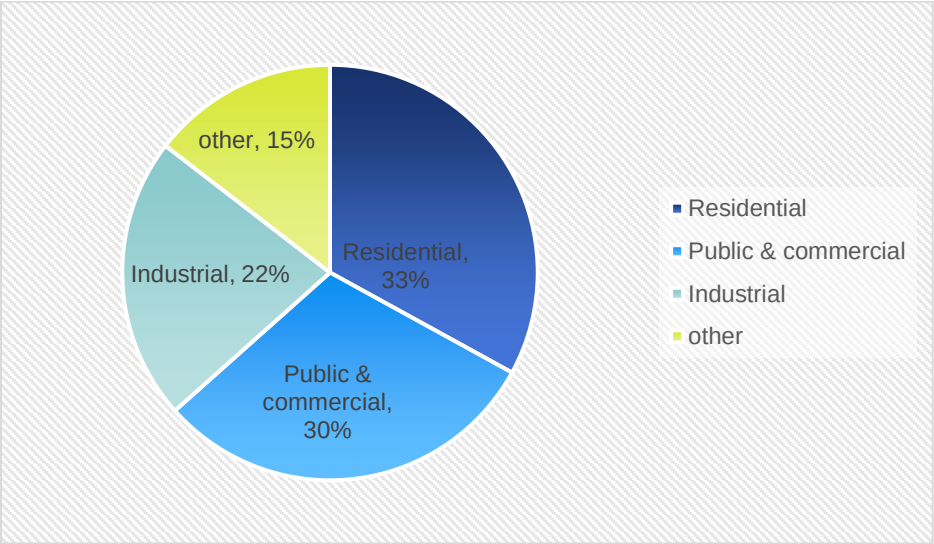
The residential and public and commercial sectors are the highest consuming sectors in Israel, accounting for approximately 33% and 30% of total consumption in 2019, respectively. This has remained steady over the period of 2010-2019.[56] In 2020, due to the COVID-19 pandemic, the share of the residential sector went up to 36% while the share of the public and commercial sector went slightly down to 28%.

Figure 24: Fuel Mix for Electricity Generation 2010-2020



[56] Central Bureau of Statistics, 2020

Figure 25: Electricity consumption by sector, 2019



Transportation

The dominant fuel for private vehicles remains petrol, with 88% of private vehicles powered by petrol in 2019, a rate that has remained constant since 2010. For other vehicles (taxis, buses and trucks), the share of vehicles powered by diesel fuel has increased from 34% in 2010 to 92% in 2019, replacing petrol.

In 2019, the share of vehicles powered by alternative fuels (gas and electric) remained very low with only 0.7% of total vehicles, a small increase from 0.3% in 2010. The total number of vehicles in Israel grew from 1,832,000 in 2000 to 2,566,191 by 2010, and then to 3,600,649 by 2019. Of this number, 86% are private cars.

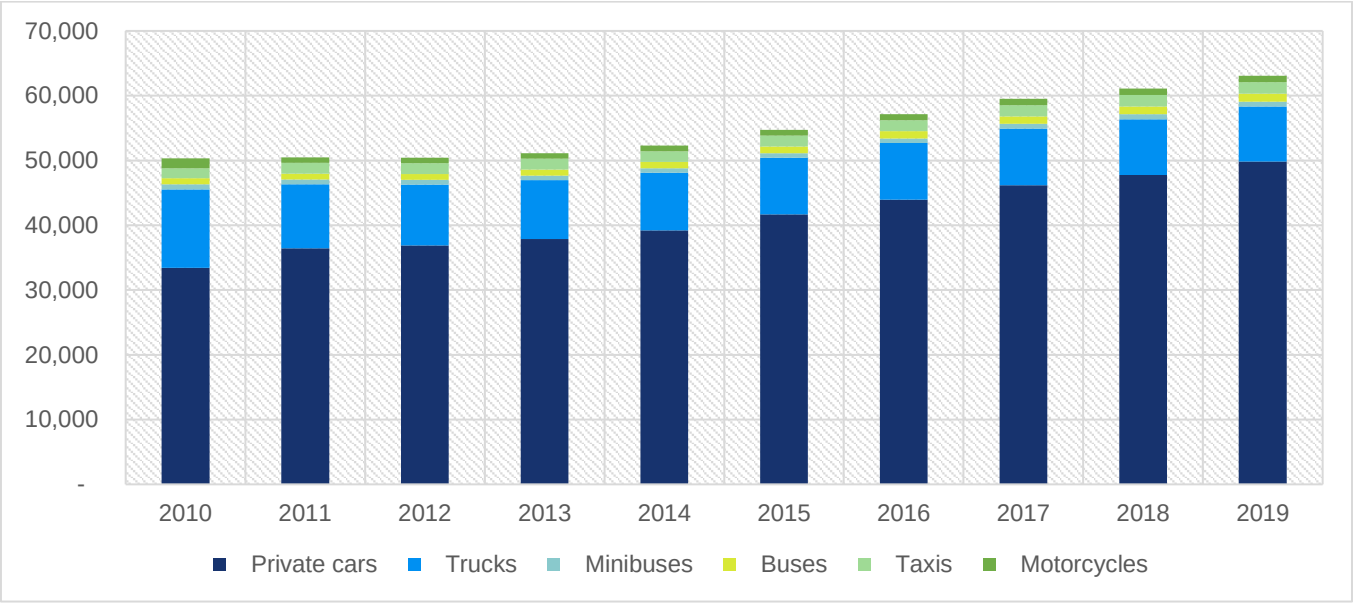
In 2019, the rate of motorization was 394 cars per 1,000 residents, an increase from 375 in 2016 and from 334 in 2010.

In 2019, total travel by road transport in Israel amounted to 63,200 million vehicle kilometers, an increase of 10% relative to 2016 (57,220 million km) and 27% relative to 2010 (49,870 million km). The vast majority of vehicle kilometers traveled - 79% (49,900 million km) - were by private cars, an increase from 77% in 2016 and 67% in 2010.[57]

The increase in private car ownership and usage has not resulted in a proportionate increase in road surface; total road length increased only by 21% over the 2000– 2019 period, from 16,450 km to 19,905 km. The disproportionate increase in vehicular traffic compared to the road surface area has increased traffic and congestion.

[57] Central Bureau of Statistics, 2020

Figure 26: Kilometers traveled, by type of vehicle, 2010-2019



Public transportation

Use of public transport increased during 2010-2019:

- An increase of 30% in bus service – travel by buses rose from 458 million km in 2010 to 597 million km in 2016 and then to 703 million km in 2019; the number of buses rose from 6,479 in 2010 to 9,024 in 2016 and then to 10,467 in 2019.
- An increase of 92% in rail ridership, from approximately 36 million passengers in 2010 to approximately 69 million passengers in 2019. [58]

To manage the congestion problems, Israel is expanding and adapting public transportation:

- **Public transport in metropolitan areas:** All four main metropolitan areas (Tel Aviv, Jerusalem, Haifa, Be'er Sheva), home to 43.5% of Israel's population, are pursuing public transportation development plans, including dedicated public transport "fast lanes", light rail trains, and metro.
  - In 2015 construction of the light rail network infrastructure began in the Tel Aviv Metropolitan Area. It is expected to be fully operational by 2028 and connect 13 cities.[59] Additionally, in 2018 the primary planning stage for the Be'er Sheva Metropolitan Area light rail network began.[60] These two projects join the already existing light rail network in Jerusalem, which is going through an expansion process, which began in 2021.[61]
  - In 2019, a new on-demand public transit service called "Bubble" was launched in 3 cities: Tel Aviv, Ramat Gan and Givatayim, and later expanded to other cities in the metropolitan area. This is a government-sponsored pilot which may expand further in the future.

[58] Central Bureau of Statistics, 2020
[59] Tel Aviv Yafo Municipality
[60] Be'er Sheva Municipality, 2018
[61] Jerusalem Municipality

- In 2021, a "Fast Lanes" project is expected to begin in the Tel Aviv Metropolitan Area. This project is a public-private partnership for the construction of separate public transportation lanes along the highway to the metropolitan area, as well as Park & Ride parking lots combined with shuttle services into the metropolitan area.[62]
- A planned subway system for the Tel Aviv Metropolitan Area is currently (2021) in the statutory planning phase. This mass transit system will link 24 cities and towns in the Metropolitan Area.[63]

- **Intercity public transport:** During 2016-2019, Israel established new rail lines, including rail transport from Beit Shean to Haifa in the Galilee region and a high-speed rail link between Tel Aviv and Jerusalem. In addition, Israel has expanded intercity highway lanes dedicated to public transport.

Other sectors

Waste

Waste and recycling trends

Israel generated approximately 5.8 million tons of MSW in 2019, compared to 5.3 million tons in 2016 and 4.6 million tons in 2010. The average Israeli generates 1.8 kg of waste per day and total waste produced is growing at an average rate of 2.6% per year, mainly due to population growth.[64]

Approximately 80% of municipal solid waste is landfilled; in 2015, 4 million tons of municipal solid waste were sent to landfills. In 2019, this increased to 4.4 million tons. [65]

In 2021 the Ministry of Environmental Protection published its new National Strategy for a Circular Economy in 2050 and a Sustainable Waste Sector in 2030, which sets ambitious targets for waste recycling and landfill reduction. The ultimate aim is a transition by 2050 from a linear economy into a circular economy, which will enable Israel to reach its goals for the three indexes listed in the table below. Another important goal of the new strategy is zero landfilling of paper and organic waste by 2030 as well as improvement of methane collection in landfills.[66] (see further details in the "Mitigation policies and measures chapter).

Table 4: Waste Management Strategy Major Goals

Index	Definition	2030 Goal	2050 Goal
Landfilling	Percentage MSW landfilling	20%	0%
Waste Sector GHG Emissions	Waste sector GHG emissions [MtCO2]	2.9	0.5
GHG Emissions Reduction	Percentage of waste sector GHG emissions reduction	47%	92%

[62] Ministry of Finance, 2020
[63] NTA
[64] Central Bureau of Statistics, 2020
[65] Central Bureau of Statistics, 2020
[66] Ministry of Environmental Protection, 2021

Government structure

Israel is a parliamentary democracy. As such, there is a joint responsibility for the nation's economic development, energy, natural resources, and many other issues affecting the welfare of Israelis. The government consists of three distinct branches: executive, legislative, and judicial. Each branch possesses distinct powers, but is not independent of the others. This creates a system of checks and balances and separates the powers to create, implement and adjudicate laws.

Executive branch

The executive branch in Israel is its government (cabinet of ministers). The executive branch is charged with implementing and enforcing the laws of Israel. The Prime Minister is the head of the executive branch, and the ministers are responsible for implementing policies in their respective fields. The ministries are as follows:

- Prime Minister's Office
- Agriculture and Rural Development
- Aliyah and Integration
- Communications
- Community Empowerment and Advancement
- Construction and Housing
- Culture and Sports
- Defense
- Development of the Negev and the Galilee
- Diaspora Affairs
- Digital Affairs
- Economy and Industry
- Education
- Energy
- Environmental Protection
- Finance
- Foreign Affairs
- Health
- Higher and Complementary Education
- Intelligence
- Interior
- Jerusalem And Heritage
- Justice
- Public Security
- Regional Cooperation
- Religious Services
- Science and Technology
- Settlement
- Social Equality
- Social Affairs and Social Services
- Tourism

- Transport and Road Safety
- Water Resources

Legislative branch

The legislative branch in Israel is its parliament, the 'Knesset'. The Knesset passes all laws, elects the President and Prime Minister (although the President ceremonially appoints the latter), approves the cabinet, and supervises the work of the government. In addition, the Knesset elects the State Comptroller.

Judicial branch

The judicial branch of Israel consists of both secular courts and religious courts. The courts constitute a separate and independent unit of the Ministry of Justice. The President of the Supreme Court and the Minister of Justice head the judicial branch. In its capacity as the High Court of Justice, the Supreme Court also acts as a court of first instance in matters concerning the legality of state decisions and actions.

Institutional arrangements

The Ministry of Environmental Protection is responsible for the formulation of a nationwide, integrated, and inclusive policy for the protection of the environment, and is Israel's key institution for climate change issues. The Ministry operates on three levels: national, regional, and local.

The ministries of Energy, Transport, Agriculture and Rural Development, Economy and Industry, and Finance also play important roles in areas concerning climate change and the environment. An Inter-ministerial Steering Committee for GHG Reductions includes representatives from the Ministry of Energy, the Electricity Authority, the National Economic Council in the Prime 'Minister's Office, the Ministry of Finance, the Ministry of Economy, the Ministry of Transport, the Ministry of Interior, the Ministry of Construction and Housing, the Ministry of Foreign Affairs, the Ministry of Health, and the Ministry of Agriculture and Rural Development.

The primary role of the Steering Committee is to assess the effectiveness of government measures to reduce emissions, including preparing cost-benefit analyses, evaluating the progress made towards meeting GHG emission reduction targets (and supporting targets), and recommending additional measures as needed. The Steering Committee reports annually to Government.

The Ministry of Environmental Protection is responsible for the preparation of UNFCCC national communications and biennial update reports, including compiling the requisite data from various government ministries and agencies, as well as other relevant stakeholders, and submitting these to the Steering Committee for approval.

The Israel Central Bureau of Statistics (CBS) prepares the National GHG Inventory annually and has a legal mandate to collect data from all stakeholders in the country.

To facilitate both the work of the Steering Committee and reporting process in accordance with its international obligations, Israel established a national Monitoring, Reporting and Verification (MRV) system,

in line with the GHG Protocol Policy and Action Standard and the Mitigation Goal Standard. The MRV system has been operational since 2018. The Ministry of Environmental Protection, as head of the Steering Committee, oversees the process.

The institutional arrangements require the ministries on the Steering Committee to provide the Ministry of Environmental Protection with the requisite data in order to prepare an annual report to the Government, as well as national reports in accordance with the country's international obligations. These arrangements are formalized within the context of government decision 1403 - National Plan for Implementation of the Greenhouse Gas Emissions Reduction Targets and for Energy Efficiency, 2016.

GHG inventory

Key developments since the last National Communication

- In 2020, Israel's total GHG emissions were 77.415 MtCO2e, representing an absolute increase of around 35% relative to 1996 GHG emissions, 16% relative to emissions in 2000, and 3% relative to 2010 emissions, and a decrease of 1.5% relative to 2015 emission levels.
- Emission intensity has shown an overall declining trend since 1996 both in terms of GHG emissions per capita and in terms of GHG emissions per GDP. In 2020, these values were the lowest since the first publication of the inventory in 1996, at 8.40 tCO2e/capita and 0.22 tCO2e/$1000 GDP.
- The share of CO2 in total emissions has declined steadily in recent years, from 87% in 2010, gradually decreasing to 84.3% in 2015, and 81.1% in 2020.
- Fuel combustion remains the predominant source of CO2 emissions and accounted for 97% of total CO2 emissions in 2020; 61.3% of fuel combustion CO2 emissions resulted from energy industries.
- Energy industries remain the largest source of CO2e emissions, accounting for 48.3% of total GHG emissions in 2020.
- Transport is the second largest source, accounting for 21.8% of total emissions in 2020. Due to the COVID-19 pandemic, transport emissions decreased by 4.2% relative to 2015.
- Emissions from the agricultural sector, mainly methane emissions from enteric fermentation and manure management, amounted to 2.2 MtCO2e in 2020, a 2.3% increase from 2015 levels.

In accordance with the guidelines for preparation of National GHG Inventories, Israel's national inventory includes the following sectors: Energy Industries, Industrial Processes, Agriculture, Waste and Wastewater, and Forestry. The inventory includes emissions and removals of the three main GHGs – carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). Since 2008, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF6) have been included in the inventory. The inventory also covers emissions of indirect GHGs, which are precursors of tropospheric ozone – carbon monoxide (CO) and nitrogen oxides (NOx) – as well as sulfur dioxide (SO2), an aerosol precursor that has a cooling effect on climate. Though not included in the national inventory, the CBS also publishes data on emissions from international bunker fuels (aviation and marine).

Methodologies

IPCC Guidelines

The revised 1996 IPCC Guidelines for National GHG Inventories were applied for the calculation of GHGs in all sectors, except agriculture and waste. As of 2011, the 2006 IPCC Guidelines for National GHG Inventories have been utilized, as they are more detailed, which fits the level of calculations used for those sectors.

Additional Guidance

In addition to IPCC Guidelines for National GHG Inventories, the 'Good Practice Guidance and Uncertainty Management in National GHG Inventories' guidelines were used for preparation of the inventory.

Tier Levels

The tier level applied in the national GHG inventory varies from sector to sector due to the varying availability of data and information:

Module 1-Energy: In principle, Tier 1 was applied, with notable exceptions being the application of Tier 2 using information that is unique to Israel such as calorific values of primary energy sources (coal, natural gas, oil shale). Tier 3 was applied for emissions of SOx, NOx, and CO from vehicles, as well as emissions of SOx and NOx from electricity generation.

Module 2-Industrial Processes: In principle, Tier 1 was applied. For some sources emission factors specific to Israeli industry were used and in that case Tier 3 was applied. Regarding emissions of fluorinated gases, a methodology was adapted specifically to Israel and therefore Tier 3 was applied.

Module 3-Solvent and Other Product Use: There is no calculation of emissions from sources as such, therefore no tier level has been applied.

Module 4- Agriculture: In principle, Tier 2 was applied, taking into account the specific processes in Israel's agriculture sector and appropriate emission factors.

Module 5- Land Use Change and Forestry: Israel uses the Tier 1 approach for estimating removals in forest land areas. There is no forest inventory in place as the forest land in Israel is negligible. However, data on forest land and on the mass of trees harvested do exist and are periodically updated.

Module 6- Waste: Tier 2 is applied to waste and Tier 1 to wastewater.

Areas where data may be further improved

Israel has encountered challenges in conducting the uncertainty analysis as well as the estimation of emissions using the reference approach and comparison to the sectoral approach; this is due to a combination of a lack of resources as well as knowledge gaps. The key category analysis has been partially conducted but has not been published. Israel would be interested in improving its data analysis capabilities through capacity- building.

- Agriculture – There remain data gaps regarding agricultural residues. No calculations were conducted for lime and urea application, since it is unclear whether this emission source is relevant to Israel.
- Energy - Data covers consumption of all fuel types, though improvement is required in estimating the distribution of consumption in the household, commercial and agricultural sectors.
- Industrial Processes – A review is being conducted in order to check the completeness of the data as well as search for additional sources of emissions.

- Solvent and Other Product Use – Emissions exist but are not calculated. Preparations are being made in order to collect data and develop a methodology.
- Waste - An update is needed for landfilled waste composition data; the latest information is from 2013.

Emissions Profile

In 2020, Israel's total GHG emissions were 77.415 million tons (Mt) CO2 equivalent (CO2e), representing an absolute increase of around 35% relative to 1996 GHG emissions, 10.9% relative to emissions in 2005, 3.5% relative to 2010 emissions, with a decrease of 1.5% relative to 2015 emission levels. The decrease in emission levels in recent years is largely due to a reduction of GHG emissions from the power sector, which peaked in 2012 (see Figure 1) due to a natural gas shortage that resulted in the increased use of more GHG-intensive fossil fuels. Once natural gas supply resumed in 2013, emissions from energy industries declined from 47.5 MtCO2e in 2012 to 40.3 MtCO2e in 2015 and further to 37.4 MtCO2e in 2020; this decline also coincides with increased uptake of renewable energy generation and policy limitations imposed on generation from existing coal-fired power plants (see Chapter 3: Mitigation Policies and Actions).

In 2020, more significant emissions reductions occurred in the transport sector, due to the various lockdown measures implemented in the country. Preliminary 2021 data show already the rebound of these emissions, implying that the emission reductions observed is not representative of the long-term trends in the sector.

Emission intensity has shown an overall declining trend since 1996 both in terms of GHG emissions per capita and in terms of GHG emissions per GDP. In 2020, these values reached their lowest levels since the inventory was first published in 1996, at 8.4 tCO2e/capita (down from 8.7 in 2019) and 0.22 tCO2e/$1000 GDP.

Figure 27: GHG emission trends

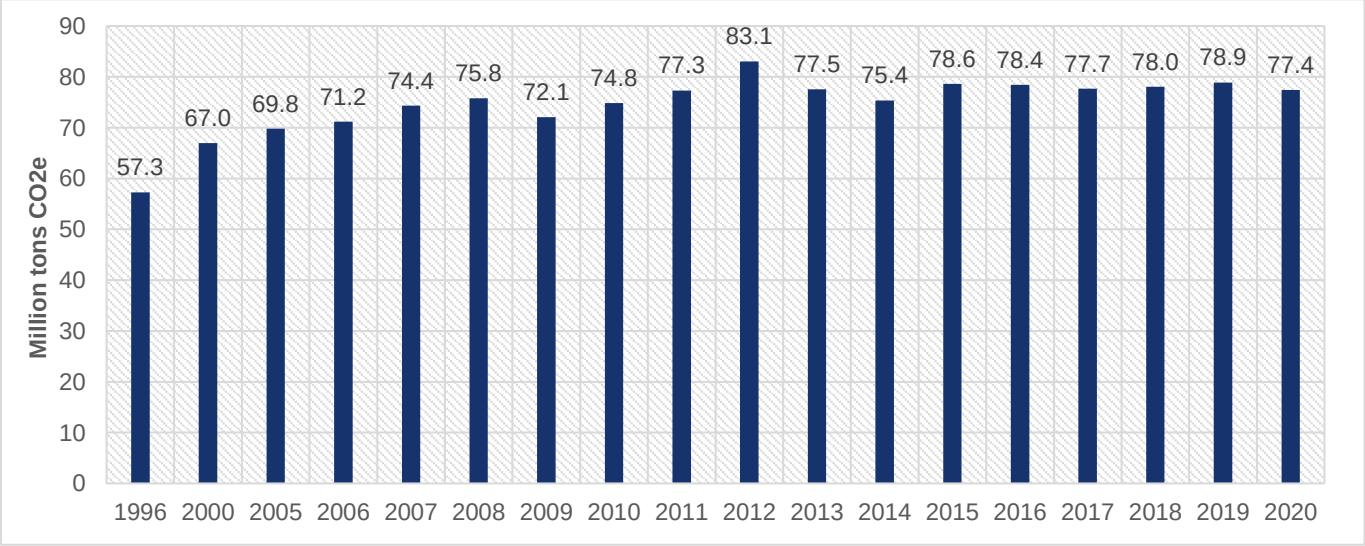
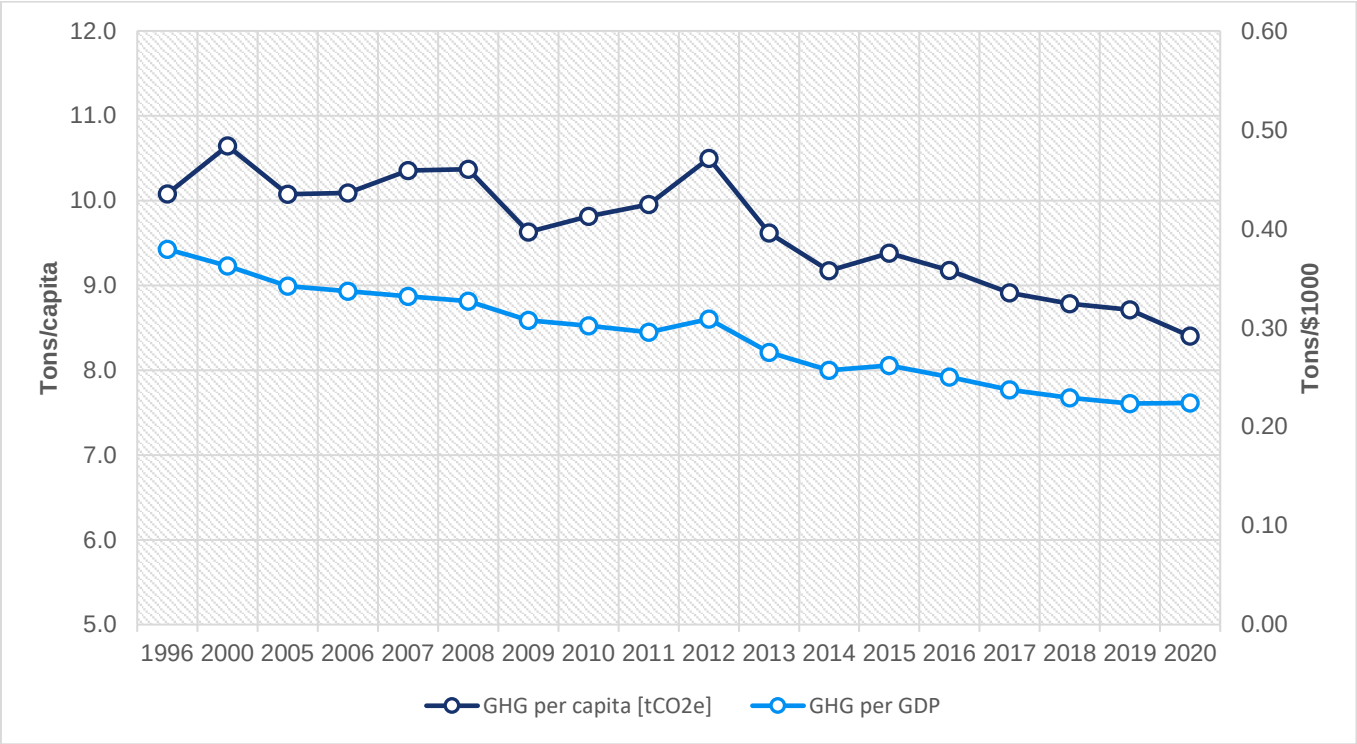


*Figure 28: GHG emission intensity**



*GDP per capita data for 1996, 2000, 2005 is based on chained GDP in 2015 prices, as this is the only data available for these years in 2015 prices.

Key emission trends by sector

Israel's inventory includes CO_2e emissions from the source categories defined by the IPCC: energy industries, manufacturing industries and construction, transport, residential/commercial/institutional sector, agriculture and waste. Key emissions trends by sector are shown in Table 5.

Table 5: GHG emissions (1000 tCO_2e) by sector in Israel, 1996, 2000, 2005, 2010, 2015, and 2020

Sector	1996	2000	2005	2010	2015	2020
Energy sector	50,598	59,052	60,670	63,199	64,002	61,084
A. Fuel combustion	50,598	59,052	60,670	63,199	64,002	61,084
1. Energy industries	28,590	36,571	39,157	40,640	40,312	37,417
2. Manufacturing industries and construction	6,746	6,788	6,113	5,457	5,208	5,993
3. Transport	11,112	14,109	14,208	16,293	17,616	16,868
4. Other sectors (residential, commercial, institutional, agriculture)	4,150	1,584	1,192	808	866	806
B. Fugitive emissions from fuels	-	-	-	-	-	-
Industrial processes	2,426	2,812	2,594	3,933	6,824	7,826.18
Agriculture	2,072	2,222	2,307	2,357	2,244	2,296.77
Waste	2,558	3,076	4,612	5,753	6,275	6,467.43

Total net emissions (excluding LULUCF)	57,653	67,163	70,183	75,241	78,734	77,414.7
Land use, land-use change and forestry	- 370	- 213	-376	- 411	- 141	-260.2
Total net emissions (including LULUCF)	57,283	66,950	69.807	75,393	78,593	7,674.8

Energy sector

Emissions from the energy sector amounted to 61.1 $MtCO_2e$ in 2020, a 4.6% decrease from 2015 (64.0 $MtCO_2e$) and a 3.3% decrease from 2010 (63.2 $MtCO_2e$); this is, however, an increase of 0.7% from 60.7 $MtCO_2e$ in 2005 and 20.7% from 50.6 $MtCO_2e$ in 1996.

Table 6: Sectoral GHG emissions

Year: 2020	CO_2 emissions (Gg)	CO_2 removals (Gg)	CH_4 (Gg)	N_2O (Gg)	CO (Gg)	NO_x (Gg)	NMVOCs (Gg)	SO_x (Gg)
Energy	60,841.17		4.12	0.51	122.06	76.92		26.26
A. Fuel combustion (sectoral approach)	60,841.17		4.12	0.51	122.06	76.92		26.26
1. Energy industries	37,311.82		0.59	0.30	9.64	38.22		18.84
2. Manufacturing industries and construction	5,970.37		0.45	0.04	6.06	9.33		5.60
3. Transport	16,758.02		2.94	0.15	106.10	28.12		1.34
4. Other sectors								
i. Commercial, institutional	254.89		0.04	0.00	0.08	0.39		0.28
ii. Residential sectors	472.84		0.08	0.00	0.15	0.75		0.05
iii. Agriculture, forestry and fishing	73.24		0.01	0.00	0.02	0.11		0.14
5. Other (please specify)								
B. Fugitive emissions from fuels								
1. Solid fuels								
2. Oil and natural gas								

Energy Industries (Power Sector)

Energy industries remain the largest source of CO_2e emissions, accounting for approximately 48% of total GHG emissions in 2020. Over the 2010-2020 period, emissions from energy industries declined by 7.9% as an increase in natural gas-based electricity generation and, to a lesser extent, renewables offset the growth

in electricity generation. This is despite a peak in emissions in 2012, which resulted from increased use of diesel oil and fuel oil to compensate for a shortage in natural gas.

Transport

Transport is the second largest source of GHG emissions, accounting for 23.7% of total emissions in 2019 (21.8% in 2020). Transport emissions increased by 6.2% in 2019 (since 2015), as the total kilometers traveled by private vehicles increased between 2015 and 2019 by 19.5%. In 2020, emissions decreased by 4.2% relative to 2015, due to the COVID pandemic and the several lockdowns that occurred in the country. However, this reduction is not indicative of the long-term trends in the sector as preliminary data already show the rebound of emissions in the sector.

Manufacturing Industries and Construction

Fuel combustion in Manufacturing Industries and Construction accounted for 7.7% of the total emissions in 2020, a decrease in the share of emissions by 20.8% from 2010 levels.

Industrial processes

GHGs are emitted from a large variety of industrial processes that are not energy related. These processes mainly transform materials, chemically or physically, and in Israel include cement production, nitric acid production, lime production, and soda ash use.[67]

Industrial process emissions amounted to 7.826 $MtCO_2e$ in 2020, an increase of 25.9% from 6.214 $MtCO_2e$ in 2015.

Table 7: Sectoral GHG emissions from industrial processes

Year: 2020	CO_2 emissions (Gg)	CO_2 removals (Gg)	CH_4 (Gg)	N_2O (Gg)	CO (Gg)	NO_x (Gg)	NMVOCs (Gg)	SO_x (Gg)	SF_6 (CO_2eq Gg)	HFCs (CO_2eq Gg)	PFCs (CO_2eq Gg)
Industrial processes	**1,833.06**		**0.21**	0.44		**0.38**	81.72	**2.34**	136.12	5,540.35	176.42
A. Mineral products											
Cement production	1,720.29							0.06			
Production of lime	100.98										
Soda ash use	7.25										

[67] Israel National GHG Inventory, CBS

Road paving with asphalt							76.17				
Container glass	4.53						0.21				
B. Chemical industry											
Nitric acid production				0.44		0.38					
Production of other chemicals			0.21				5.35				
Sulphuric Acid								2.28			
C. Metal production											
D. Other production											
E. Production of halocarbons and sulphur hexafluoride											
F. Consumption of halocarbons and sulphur hexafluoride									136.12	5,540.35	176.42
G. Other (please specify)											

Agriculture

Emissions from the agricultural sector amounted to 2.3 $MtCO_2e$ in 2020, a 2.3% increase from 2015 levels. These emissions largely consist of methane emissions from enteric fermentation and manure management.

Table 8: Sectoral emissions from agriculture

Year: 2020	CO_2 emissions (Gg)	CO_2 removals (Gg)	CH_4 (Gg)	N_2O (Gg)	CO (Gg)	NO_x (Gg)	NMVOCs (Gg)	SO_x (Gg)	SF_6 (CO_2eq Gg)	HFCs (CO_2eq Gg)	PFCs (CO_2eq Gg)
4. Agriculture			43.28	4.48							
A. Enteric fermentation			40.06								
B. Manure management			3.23	0.66							
C. Rice cultivation											

D. Agricultural soils				3.81							
E. Prescribed burning of savannahs											
F. Field burning of agricultural residues											
G. Other (please specify)											

Waste

In 2020, emissions from waste and wastewater amounted to 6.4 $MtCO_2e$, an increase of 3.1% from 6.3 $MtCO_2e$ in 2015.

Table 9: Sectoral emissions from waste

Year: 2020	CO_2 emissions (Gg)	CO_2 removals (Gg)	CH_4 (Gg)	N_2O (Gg)	CO (Gg)	NO_x (Gg)	NMVOCs (Gg)	SO_x (Gg)	SF_6 (CO_2eq Gg)	HFCs (CO_2eq Gg)	PFCs (CO_2eq Gg)
6. Waste			304.16	0.26							
A. Solid waste disposal on land			269.91								
B. Biological Treatment of Solid Waste			4.56	0.20							
C. Waste incineration											
D.Waste-water handling			29.69	0.06							
E. Other (please specify)											

Forestry

In 2018, Israel's forest area included 116.3 thousand hectares of grove and woodland, out of which 80.9 thousand hectares are planted and 23 thousand hectares consist of natural woodlands.[68]. Net GHG removal by forests in 2020 was 260 tCO_2e, up by 84% from 141 tCO_2e in 2015, but down by 37% from 411 tCO_2e in 2010 and by 31% from 376 tCO_2e in 2005.

[68] Keren Kayemeth LeIsrael Jewish National Fund

It should be noted that emissions and removals from Soil Organic Carbon (SOC) pools or deadwood are not calculated; furthermore, grasslands, croplands, settlements, wetlands and other lands are not included in the calculation as they are considered to have a relatively insignificant impact in Israel.

International Bunkers

Emissions from international bunkers are also calculated by the CBS, although they are not included in the national inventory.

Emissions of direct GHGs from international bunkers peaked at 3,659 $ktCO_2e$ in 2008, before following a general downward trend until reaching a minimum of 2,918 $ktCO_2e$ in 2014. Then, emissions began increasing. From 2015 to 2019, CO_2e emissions increased by 34% to 4,686 $ktCO_2e$. However, in 2020 that figure fell 46% to 2,531 $ktCO_2e$ relative to the previous year, due to the COVID pandemic and the related travel restrictions.

Table 10: Emissions from international bunkers

Thousand tons	1996	2000	2005	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Direct (CO_2e):	2,225	2,803	2,955	3,485	3,659	3,534	3,617	3,570	3,450	3,289	2,918	3,498	3,382	3,997	4,350	4,686	2531
CO_2	**2,207**	**2,781**	**2,933**	**3,460**	**3,633**	**3,509**	**3,590**	**3,544**	**3,425**	**3,263**	**2,894**	**3,470**	**3,355**	**3,965**	**4,316**	**4,650**	**2515**
Aviation	1,924	2,298	2,069	2,400	2,434	2,413	2,549	2,571	2,420	2,494	2,521	2,670	2,874	3,222	3,387	3,541	1288
Marine	283	483	864	1,060	1,199	1,095	1,041	973	1,005	769	374	801	481	744	928	1,110	1227
CH_4	**0.033**	**0.048**	**0.071**	**0.086**	**0.096**	**0.089**	**0.086**	**0.082**	**0.083**	**0.068**	**0.042**	**0.071**	**0.052**	**0.072**	**0.085**	**0.098**	**0.09**
Aviation	0.014	0.016	0.015	0.017	0.017	0.017	0.018	0.018	0.017	0.018	0.018	0.019	0.020	0.023	0.024	0.025	0.01
Marine	0.019	0.032	0.057	0.070	0.079	0.072	0.068	0.064	0.066	0.051	0.025	0.053	0.032	0.049	0.061	0.073	0.08
N_2O	**0.056**	**0.069**	**0.065**	**0.076**	**0.078**	**0.077**	**0.080**	**0.080**	**0.076**	**0.077**	**0.074**	**0.082**	**0.085**	**0.097**	**0.103**	**0.109**	**0.05**
Aviation	0.054	0.065	0.058	0.068	0.069	0.068	0.072	0.073	0.068	0.070	0.071	0.075	0.081	0.091	0.096	0.100	0.04
Marine	0.002	0.004	0.007	0.008	0.009	0.009	0.008	0.008	0.008	0.006	0.003	0.006	0.004	0.006	0.007	0.009	0.01
Indirect: NO_x	**13.7**	**19.3**	**25.8**	**31.0**	**33.9**	**31.8**	**31.3**	**30.1**	**30.1**	**25.7**	**18.1**	**27.1**	**21.7**	**28.3**	**32.7**	**36.9**	**29.64**
Aviation	8.1	9.7	8.8	10.2	10.3	10.2	10.8	10.9	10.3	10.6	10.7	11.3	12.2	13.7	14.4	15.0	5.46
Marine	5.6	9.5	17.0	20.9	23.6	21.5	20.5	19.2	19.9	15.2	7.4	15.8	9.5	14.7	18.32	21.906	24.18

NMVOCs	**2.1**	**2.9**	**3.7**	**4.5**	**4.9**	**4.6**	**4.5**	**4.4**	**4.4**	**3.8**	**2.8**	**4.0**	**3.3**	**4.2**	**4.84**	**5.4**	**4.13**
Aviation	1.4	1.6	1.5	1.7	1.7	1.7	1.8	1.8	1.7	1.8	1.8	1.9	2.0	2.3	2.393	2.5	0.91
Marine	0.8	1.3	2.3	2.8	3.1	2.9	2.7	2.6	2.6	2.0	1.0	2.1	1.3	2.0	2.443	2.9	3.22
SO_x	**6.0**	**9.3**	**13.6**	**15.2**	**14.8**	**13.8**	**13.3**	**12.4**	**12.0**	**9.1**	**6.8**	**9.7**	**8.1**	**10.2**	**11.54**	**12.8**	**5.97**
Aviation	3.7	4.4	3.9	4.6	4.6	4.6	4.8	4.9	4.6	4.7	4.8	5.1	5.5	6.1	6.440	6.7	2.45
Marine	2.4	4.9	9.6	10.6	10.2	9.2	8.5	7.5	7.4	4.3	2.0	4.6	2.6	4.1	5.102	6.04	3.52
CO	**6.5**	**9.6**	**14.3**	**17.3**	**19.2**	**17.8**	**17.3**	**16.4**	**16.7**	**13.6**	**8.5**	**14.3**	**10.4**	**14.3**	**17.00**	**19.6**	**17.94**
Aviation	2.7	3.2	2.9	3.4	3.4	3.4	3.6	3.6	3.4	3.5	3.6	3.8	4.1	4.6	4.786	5.0	1.82
Marine	3.7	6.4	11.4	13.9	15.7	14.4	13.7	12.8	13.2	10.1	4.9	10.5	6.3	9.8	12.22	14.6	16.12

KEY EMISSIONS TRENDS BY GAS

Table 12 summarizes GHG emissions by gas, as calculated for 1996, 2000 and 2005-2019. All emissions are expressed as CO2e.

Table 11: Summary of GHG inventory

Carbon Dioxide (CO_2).

(1000 tCO2e, unless stated otherwise)	1996	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total GHG	57,283	66,950	69807	71,164	74,354	75,797	72,090	74,830	77,308	83,050	77,527	75,372	78,593	78,413	77,656	78,031	78,888	77,415
GHG per capita	10.1	10.6	10.1	10.1	10.4	10.4	9.6	9.8	10.0	10.5	9.6	9.2	9.4	9.2	8.9	8.8	8.7	8.4
GHG per GDP (2015 prices)	0.38	0.36	0.34	0.34	0.33	0.33	0.31	0.30	0.30	0.31	0.28	0.26	0.26	0.25	0.24	0.23	0.22	0.22
Carbon Dioxide (CO2)	52,232	61,251	62,841	63,867	66,692	66,175	63,351	65,217	67,271	72,538	66,418	64,413	66,225	65,283	65,005	64,654	65,902	62,781
Methane (CH4)	3523	3888	5530	5820	6045	6267	6388	6715	6727	6935	6964	7095	7109	7254	7307	7391	7297	7387
Nitrous Oxides (N2O)	1898	2207	2543	2564	2754	2600	2363	2414	1929	2261	2237	2338	2297	2253	1788	1976	1958	1761
Sulfur hexafluoride (SF6)	-	-	-	-	-	1107	166	87	126	81	89	100	84	99	93	93	117	136
Hydrofluoro carbons (HFC'S)	-	-	-	-	-	660	720	1325	1857	2039	2568	2111	3460	4127	3635	4308	3974	5540

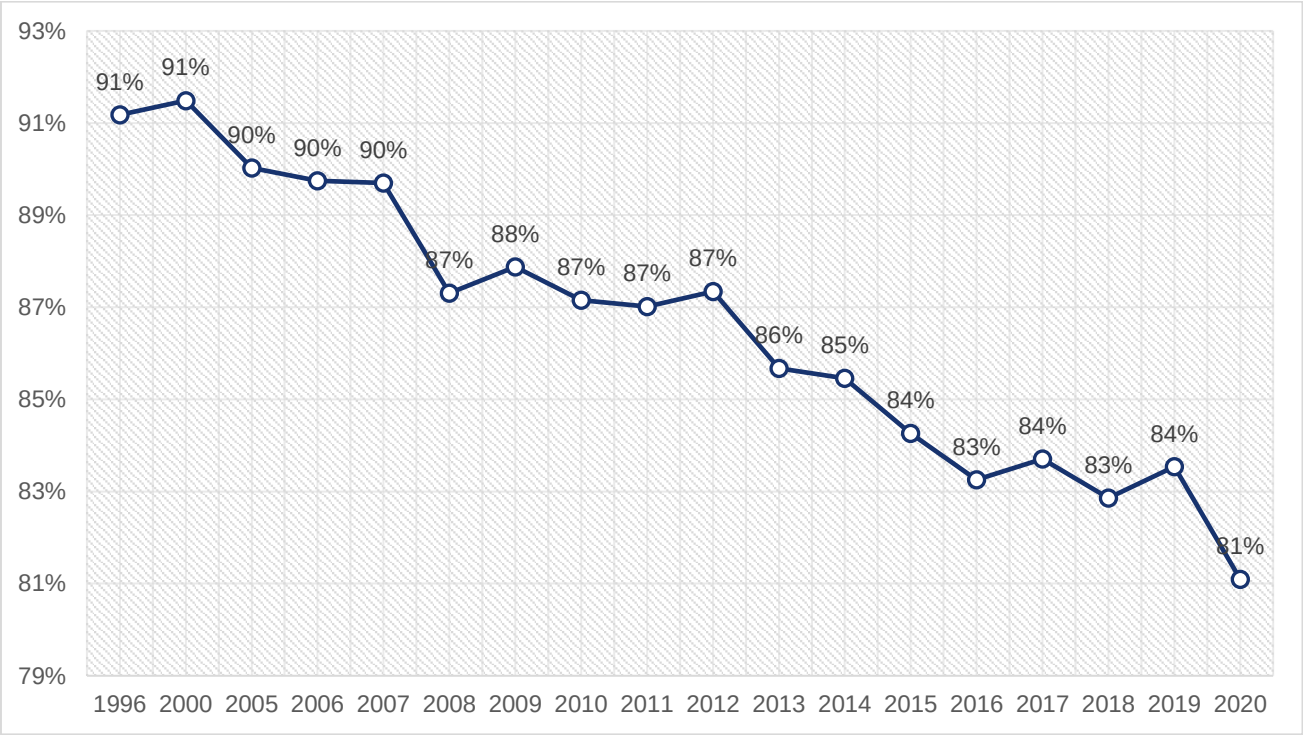
Perfluorocarbons (PFC'S)	-	-	-	-	-	51	31	109	104	95	125	103	113	125	156	174	185	176

Although CO_2 remains the predominant GHG emitted in Israel, its share of total emissions has steadily declined over the last decade, from 87% in 2010, to 84% in 2015, and 81% in 2020. In 2020, Israel emitted (net of removals) 62.7 million tons of CO_2, a 5.2% decrease from 2015. The predominant source of CO_2 emissions remains fuel combustion, which accounted for 97% of total CO_2 emissions in 2020; of those emissions 61.3% were caused by energy industries, as seen in Table 12.

Table 12: CO_2 emissions by sector [$ktCO_2$]

CO2 emissions	1996	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total emissions and removals	**52,232**	**61, 251**	**62,841**	**63,867**	**66,692**	**66,175**	**63,351**	**65,217**	**67,271**	**72,538**	**66,418**	**64,413**	**66,225**	**65,283**	**65,005**	**64,654**	**65,901**	62,780
A. From fuel combustion	50,344	58,765	60,382	61,307	64,128	63,700	61,263	62,912	64,720	69,988	63,961	61,843	63,724	63,061	62,930	62,614	63,846	60,084
1. Energy industries	28,466	36,412	38,986	39,607	41,773	41,459	39,285	40,482	42,081	47,281	41,313	38,890	40,173	38,800	37,917	37,163	38,242	37,311
2. Manufacturing, industries and construction	6,720	6,759	6,094	6,007	6,059	5,915	5,483	5,441	5,637	5,417	5,183	5,442	5,190	5,398	5,633	5,967	6,133	5,970
3. Transport	11,031	14,018	14,117	14,549	15,198	15,346	15,550	16,186	16,074	16,374	16,626	16,660	17,500	17,991	18,459	18,576	18,589	16,758
4. Other	4,127	1,575	1,185	1,143	1,097	980	945	803	929	916	840	851	860	871	921	909	882	806
B. industrial processes	1,888	2,303	2,351	2,453	2,457	2,368	1,981	2,197	2,444	2,443	2,349	2,463	2,395	2,150	2,142	1,933	1,950	1,833
C. Land-use change and forestry	-370	-213	-376	-396	-385	-347	-367	-411	-414	-325	-291	-163	-141	-206	-176	-256	-283	-260
1. CO2 emissions and removals from soil	-	183	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107
2. Changes in forest and other woody biomass stocks	-370	-396	-482	-503	-491	-453	-474	-518	-521	-432	-398	-270	-248	-313	-282	-363	-390	-367

Figure 29: Share of CO2 in total emissions, 1996-2020



Methane (CH_4)

In 2020, methane emissions amounted to 352 kt which are equivalent to 7,387 $ktCO_2$ (10% of total GHG emissions), an increase of 90% relative 2000, 10% relative to 2010 and 3.2% relative to 2015. Solid waste disposal remains the dominant source of CH_4 emissions, accounting for 77% of total CH_4 emissions in 2020.

Table 13: CH_4 emissions by sector [1000 tons]

CH4 emissions	1996	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total emissions	**168**	**185**	**263**	**277**	**288**	**298**	**304**	**321**	**322**	**332**	**334**	**340**	**341**	**348**	**350**	**353**	**350**	**351**
From fuel combustion	3.55	3.46	3.31	3.38	3.53	3.58	3.54	3.69	3.76	4.02	3.82	3.85	4.08	4.24	4.36	4.40	**5**	4.1
From Industrial processes	-	0.20	0.18	0.13	0.20	0.21	0.22	0.20	0.24	0.23	0.19	0.21	0.21	0.14	0.21	0.20	**0.21**	0.2
From Agriculture	42.42	43.81	41.82	44.26	44.36	45.87	44.56	45.74	38.13	38.53	39.63	39.91	40.96	40.27	40.06	42.01	**44.19**	43.28
From solid waste disposal on land	111.8	127.7	188.8	200.5	210.7	220.3	228.3	235.6	243.2	252.7	255.1	260.7	259.3	267.8	271.1	270.1	**266**	269.9
From waste-water treatment	10.0	10.0	26.6	26.6	25.8	25.6	24.7	32.0	33.4	33.2	31.3	31.5	32.3	31.5	30.8	31.5	**30**	29.7

Nitrous Oxide (N_2O)

In 2020, nitrous oxide emissions amounted to 5.68 kt which are equivalent to 1,760.8 $ktCO_2$ (2.3% of total GHG emissions), representing a decrease of 2.3% and 20.2% from 2015 and 2000, respectively. Agriculture represents the largest share of N_2O emissions. Total N_2O emissions from this sector increased by only 0.3% from 2015 to 2020.

Table 14: N_2O emissions by sector [1000 tons]

	1996	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total emissions	6.12	7.12	6.24	6.41	6.87	6.44	6.17	6.06	5.49	5.65	5.55	5.74	5.81	5.76	5.58	5.69	5.68	5.68
From fuel combustion	0.58	0.69	0.70	0.70	0.73	0.70	0.67	0.67	0.70	0.79	0.66	0.62	0.62	0.58	0.56	0.54	0.56	0.51
From agriculture	3.81	4.20	4.61	4.82	5.16	4.83	4.59	4.50	4.01	3.98	4.18	4.40	4.46	4.30	4.53	4.48	4.44	4.48
From Industrial processes	1.73	1.63	0.77	0.72	0.81	0.72	0.71	0.68	0.57	0.67	0.50	0.52	0.51	0.65	0.24	0.42	0.42	0.44

Fluorinated Gases (SF_6, HFCs, and PFCs)

In 2020, fluorinated gas emissions totaled 5,853 $ktCO_2e$ (8% of total GHG emissions), an increase of 222% relative to 2008 (the first year in which these gases were included in the inventory) in which fluorinated gas emissions totaled 1,818 $ktCO_2e$ and 60% relative to 2015, in which fluorinated gas emissions totaled 3,657 $ktCO_2e$. HFCs are the largest source of F-gas emissions in Israel, representing 95% of those emissions in 2020.

Table 15: F-gas emissions [ktCO2e]

	1996	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Sulfur hexafluoride (SF6)	-	-	-	-	-	1,107	166	87	126	81	89	100	84	99	93	93	117	136
Hydrofluorocarbons (HFC'S)	-	-	-	-	-	660	720	1,325	1,857	2,039	2,568	2,111	3,460	4,127	3,614	4,304	3,967	5,540
Perfluorocarbons (PFC'S)	-	-	-	-	-	51	31	109	104	95	125	103	113	125	156	174	185	176

Indirect GHG emissions

The inventory includes the emissions of the following GHG precursors:

Nitrogen oxides (NO_x) – The largest anthropogenic source of NO_x is fuel combustion activities, especially from energy production and mobile sources. Nitrogen oxides are formed through two separate mechanisms: the conversion of chemically bound nitrogen in fuel and the fixation of atmospheric nitrogen through the combustion process. The former contributes most of the NO_x

emitted from coal combustion, whereas the latter is dominant in oil combustion and is the sole mechanism for combustion of gaseous fuels.

Carbon monoxide (CO) – In terms of fuel combustion, motor vehicles and small combustion equipment in the residential sector cause the majority of CO emissions. The amount of CO emissions from fuel combustion in mobile sources is a function of the efficiency of combustion and post-combustion emission controls.

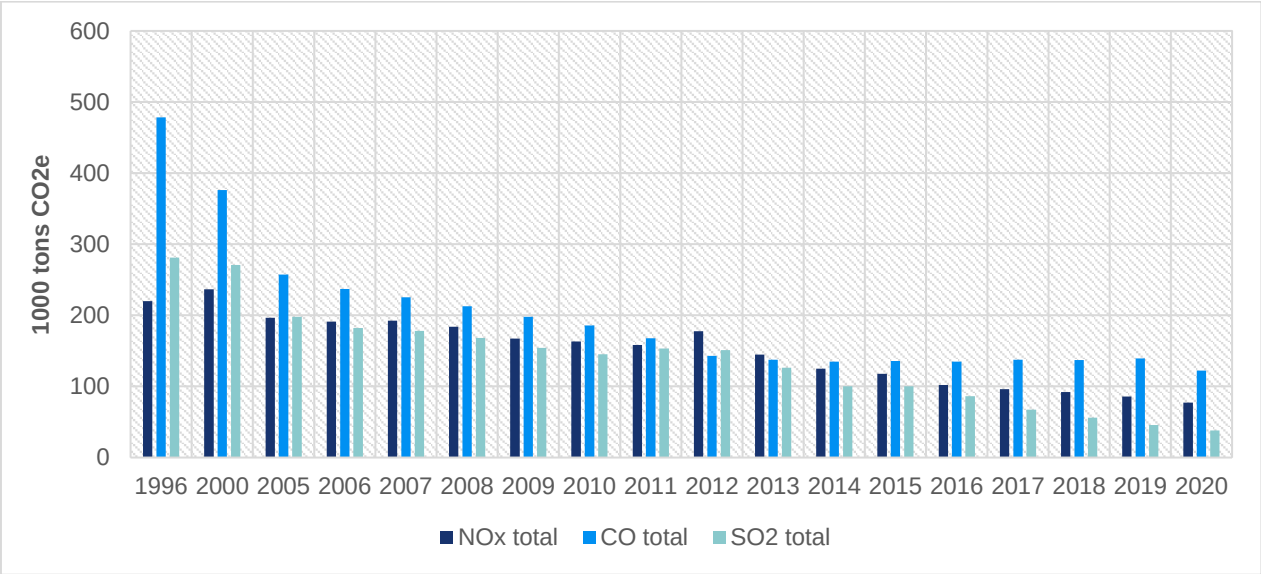
Sulfur dioxide (SO_2) - The sulfur content in fuels is primarily responsible for the amount of SO_2 emissions from their combustion.

Between 1996 and 2020, emissions of NO_x, CO and SO_x decreased by 65%, 74% and 90%, respectively.

Table 16: Indirect GHG emissions by sector

Indirect GHG emissions	1996	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
NOx total	**220**	**237**	**197**	**191**	**192**	**184**	**167**	**163**	**158**	**178**	**145**	**125**	**118**	**102**	**96**	**92**	**86**	**77**
A. From fuel combustion	215	232	195	190	191	183	167	162	157	177	144	124	117	101	96	92	**85**	**77**
CO total	**478**	**376**	**257**	**237**	**226**	**213**	**198**	**186**	**168**	**143**	**138**	**135**	**136**	**135**	**137**	**137**	**139**	**122**
A. From fuel combustion	478	376	257	237	226	213	198	186	168	143	138	135	136	135	137	137	**139**	**122**
1. From transport	469	367	247	227	215	203	189	176	157	131	127	124	123	123	124	123	**123**	**106**
SO2 total	**281**	**271**	**198**	**182**	**178**	**183**	**154**	**145**	**153**	**136**	**108**	**92**	**91**	**75**	**57**	**46**	**34**	**29**
A. From fuel combustion	262	269	194	177	173	164	150	141	149	131	104	88	85	68	52	42	**31**	**26**
B. From Industrial processes	19.1	2.7	4.4	4.8	4.9	4.7	3.9	4.4	4.6	4.3	4.9	4.8	5.2	5.6	4.9	3.6	**2.7**	**2.34**

Figure 30: Indirect GHG emissions from fuel combustion



Full Inventory Tables

Table 17: Full Inventory Tables

1996	CO_2 emissions (Gg)	CO_2 removals (Gg)	CH_4 (Gg)	N_2O (Gg)	CO (Gg)	NO_x (Gg)	NMVOCs (Gg)	SO_x (Gg)
Total national emissions and removals	**52,232.30**	**-370.00**	**167.76**	**6.12**	**478.18**	**219.90**	**247.42**	**281.13**
1. Energy	**50,344.00**		**3.55**	**0.58**	**477.70**	**214.74**	**157.98**	**262.00**
A. Fuel combustion (sectoral approach)	50,344.00		3.55	0.58	477.7	214.74	157.98	262.00
1. Energy industries	28,466.00		0.57	0.36	5.96	86.38	1.64	190.71
2. Manufacturing industries and construction	6,720.00		0.23	0.07	1.15	22.68	0.57	45.57
3. Transport	11,031.00		2.18	0.12	469.44	99.92	155.48	12.61
4. Other sectors								
Commercial, institutional residential sectors	3,520.00		0.49	0.03	0.98	4.90	0.25	10.52
Agriculture, forestry and fishing	607.00		0.09	0.01	0.17	0.85	0.04	2.60
5. Other (please specify)								
B. Fugitive emissions from fuels								
1. Solid fuels								
2. Oil and natural gas								
2. Industrial processes	**1,888.30**		-	**1.73**	**0.48**	**5.16**	**89.44**	**19.14**
A. Mineral products								
CEMENT PRODUCTION	1,673.00							1.01
PRODUCTION OF LIME	106.70							
SODA ASH USE	16.60							

ROAD PAVING WITH ASPHALT							85.77	
Container Glass								
B. Chemical industry								
NITRIC ACID PRODUCTION			1.73		0.48	5.16		
Ethylene								
PRODUCTION OF OTHER CHEMICALS	92.00						3.67	0.00
Sulphuric Acid								18.13
C. Metal production								
D. Other production								
E. Production of halocarbons and sulphur hexafluoride								
F. Consumption of halocarbons and sulphur hexafluoride								
G. Other (please specify)								
3. Solvent and other product use								
4. Agriculture			**42.42**	**3.810**				
A. Enteric fermentation			32.42					
B. Manure management			10.00	0.80				
C. Rice cultivation			-	-				
D. Agricultural soils			-	3.01				
E. Prescribed burning of savannahs			-	-				
F. Field burning of agricultural residues			-	-				
G. Other (please specify)			-	-				
5. Land-use change and forestry	**-**	**-370.00**						
A. Changes in forest and other woody biomass stocks	-	-370.00						
B. Forest and grassland conversion	-	-						
C. Abandonment of managed lands	-	-						
D. CO_2 emissions and removals from soil		-						
E. Other (please specify)								
6. Waste			**121.79**	**-**	-	-	-	
A. Solid waste disposal on land			111.79					
B. Waste-water handling			10.00					
C. Waste incineration								
D. Other (please specify)								
7. Other (please specify)								
Memo items								
International bunkers	**2,207.00**		**0.03**	**0.06**	**6.46**	**13.70**	**2.11**	**6.01**
Aviation	1,924.00		0.01	0.05	2.72	8.10	1.36	3.66
Marine	283.00		0.02	0.00	3.74	5.60	0.75	2.35
CO_2 emissions from biomass								

2000	CO_2 emissions (Gg)	CO_2 removals (Gg)	CH_4 (Gg)	N_2O (Gg)	CO (Gg)	NO_x (Gg)	NMVOCs (Gg)	SO_x (Gg)
Total national emissions and removals	**61,251.15**	**-396.00**	**185.16**	**7.12**	**376.12**	**236.67**		**271.62**
1. Energy	**58,764.79**		**3.46**	**0.69**	**376.12**	**231.80**		**268.89**
A. Fuel combustion (sectoral approach)	58,764.79		3.46	0.69	376.12	231.80		268.89
1. Energy industries	36,411.76		0.73	0.47	7.64	110.72		209.14
2. Manufacturing industries and construction	6,759.39		0.25	0.07	1.48	24.68		50.81
3. Transport	14,018.35		2.25	0.14	366.54	94.10		4.79
4. Other sectors								
Commercial, institutional	378.80		0.05	0.00	0.11	0.55		1.83
residential sectors	838.01		0.12	0.01	0.25	1.25		0.33
Agriculture, forestry and fishing	358.47		0.05	0.00	0.10	0.50		2.00
5. Other (please specify)								
B. Fugitive emissions from fuels								
1. Solid fuels								
2. Oil and natural gas								
2. Industrial processes	**2,303.03**		**0.20**	**1.63**		**4.87**	**83.51**	**2.73**
A. Mineral products								
CEMENT PRODUCTION	2,152.13							0.31
PRODUCTION OF LIME	134.30							
SODA ASH USE	16.60							
ROAD PAVING WITH ASPHALT							78.40	
Container Glass	-						0.77	
B. Chemical industry								
NITRIC ACID PRODUCTION				1.63		4.87		
PRODUCTION OF OTHER CHEMICALS			0.20				4.34	
Sulphuric Acid								2.42
C. Metal production								
D. Other production								
E. Production of halocarbons and sulphur hexafluoride								
F. Consumption of halocarbons and sulphur hexafluoride								
G. Other (please specify)								
3. Solvent and other product use								
4. Agriculture			**43.81**	**4.20**				
A. Enteric fermentation			33.42					
B. Manure management			10.39	0.83				
C. Rice cultivation			-	-				
D. Agricultural soils			-	3.37				
E. Prescribed burning of savannahs			-	-				

F. Field burning of agricultural residues			-	-				
G. Other (please specify)			-	-				
G. Other (please specify)								
5. Land-use change and forestry	**183.33**	**-396.00**						
A. Changes in forest and other woody biomass stocks	-	-396.00						
B. Forest and grassland conversion	-	-						
C. Abandonment of managed lands	-	-						
D. CO_2 emissions and removals from soil	183.33	-						
E. Other (please specify)	-	-						
6. Waste			**137.68**	**0.5970**	**-**	**-**	**-**	
A. Solid waste disposal on land			127.69					
B. Waste-water handling			9.99	0.60				
C. Waste incineration								
D. Other (please specify)								
7. Other (please specify)								
Memo items								
International bunkers	**2,780.97**		**0.05**	**0.07**	**9.61**	**19.28**	**2.90**	**9.27**
Aviation	2,298		0.02	0.06	3.25	9.74	1.62	4.37
Marine	483		0.03	0.00	6.36	9.55	1.27	4.90
CO_2 emissions from biomass								

2005	CO_2 emissions (Gg)	CO_2 removals (Gg)	CH_4 (Gg)	N_2O (Gg)	CO (Gg)	NO_x (Gg)	NMVOCs (Gg)	SO_x (Gg)
Total national emissions and removals	62,840.79	-482.22	262.54	6.24	257.12	196.44		197.99
1. Energy	60,382.24		3.31	0.70	257.12	195.35		193.62
A. Fuel combustion (sectoral approach)	60,382.24		3.31	0.70	257.12	195.35		193.62
1. Energy industries	38,985.89		0.64	0.51	8.08	109.66		147.55
2. Manufacturing industries and construction	6,094.36		0.17	0.05	1.58	15.67		41.63
3. Transport	14,116.79		2.32	0.14	246.74	68.23		2.10
4. Other sectors								
Commercial, institutional	506.36		0.07	0.00	0.15	0.73		2.12
residential sectors	556.65		0.09	0.01	0.17	0.87		0.13
Agriculture, forestry and fishing	122.20		0.02	0.00	0.40	0.19		0.09
5. Other (please specify)								
B. Fugitive emissions from fuels								
1. Solid fuels								
2. Oil and natural gas								
2. Industrial processes	2,351.92		0.18	0.77		1.09	72.39	4.37
A. Mineral products								
CEMENT PRODUCTION	2,157.57							0.08
PRODUCTION OF LIME	134.30							

SODA ASH USE	22.34							
ROAD PAVING WITH ASPHALT							68.00	
Container Glass	37.71						0.99	
B. Chemical industry								
NITRIC ACID PRODUCTION				0.77		1.09		
PRODUCTION OF OTHER CHEMICALS			0.18				3.39	
Sulphuric Acid								4.29
C. Metal production								
D. Other production								
E. Production of halocarbons and sulphur hexafluoride								
F. Consumption of halocarbons and sulphur hexafluoride								
G. Other (please specify)								
3. Solvent and other product use								
4. Agriculture			41.82	4.61				
A. Enteric fermentation			32.43					
B. Manure management			9.39	0.80				
C. Rice cultivation			-	-				
D. Agricultural soils			-	3.80				
E. Prescribed burning of savannahs			-	-				
F. Field burning of agricultural residues			-	-				
G. Other (please specify)			-	-				
5. Land-use change and forestry	106.63	-482.22						
A. Changes in forest and other woody biomass stocks	-	-482.22						
B. Forest and grassland conversion	-	-						
C. Abandonment of managed lands	-	-						
D. CO_2 emissions and removals from soil	106.63	-						
E. Other (please specify)	-	-						
6. Waste			217.23	0.16				
A. Solid waste disposal on land			188.77					
B. Biological Treatment of Solid Waste			1.85	0.10				
C. Waste incineration								
D.Waste-water handling			26.62	0.07				
E. Other (please specify)								
7. Other (please specify)								
Memo items								
International bunkers	2,933		0.07	0.07	14.28	25.80	3.73	13.57
Aviation	2,069		0.01	0.06	2.92	8.77	1.46	3.93
Marine	864		0.06	0.01	11.36	17.04	2.27	9.64

2010	CO_2 emissions (Gg)	CO_2 removals (Gg)	CH_4 (Gg)	N_2O (Gg)	CO (Gg)	NO_x (Gg)	NMVOCs (Gg)	SO_x (Gg)	SF_6 (CO_2eq Gg)	HFCs (CO_2eq Gg)	PFCs (CO_2eq Gg)
Total national emissions and removals	**65,216.65**	**-517.70**	**320.52**	**6.06**	**185.55**	**163.30**		**145.37**	**86.63**	**1,325.15**	**108.79**
1. Energy	**62,912.33**		**3.69**	**0.67**	**185.55**	**162.33**		**140.98**			
A. Fuel combustion (sectoral approach)	62,912.33		3.69	0.67	185.55	162.33		140.98			
1. Energy industries	40,482.40		0.59	0.47	7.77	97.63		118.40			
2. Manufacturing industries and construction	5,440.69		0.20	0.04	1.69	12.93		20.35			
3. Transport	16,186.12		2.77	0.16	175.83	50.50		1.96			
4. Other sectors											
Commercial, institutional	394.90		0.06	0.00	0.12	0.62		0.17			
residential sectors	369.25		0.06	0.00	0.12	0.58		0.05			
Agriculture, forestry and fishing	38.97		0.01	0.00	0.01	0.06		0.04			
5. Other (please specify)											
B. Fugitive emissions from fuels											
1. Solid fuels											
2. Oil and natural gas											
2. Industrial processes	**2,197.69**		**0.20**	**0.68**		**0.97**	**74.31**	**4.40**	**86.63**	**1,325.15**	**108.79**
A. Mineral products											
CEMENT PRODUCTION	2,023.46							0.15			
PRODUCTION OF LIME	121.74										
SODA ASH USE	20.06										
ROAD PAVING WITH ASPHALT							68.39				
Container Glass	32.43						0.86				
B. Chemical industry											
NITRIC ACID PRODUCTION				0.68		0.97					
PRODUCTION OF OTHER CHEMICALS			0.20				5.06				
Sulphuric Acid								4.25			
C. Metal production											
D. Other production											
E. Production of halocarbons and sulphur hexafluoride											
F. Consumption of halocarbons and sulphur hexafluoride									86.63	1,325.15	108.79
G. Other (please specify)											
3. Solvent and other product use											

4. Agriculture			**45.74**	**4.50**							
A. Enteric fermentation			34.62								
B. Manure management			11.12	0.92							
C. Rice cultivation			-	-							
D. Agricultural soils			-	3.58							
E. Prescribed burning of savannahs			-	-							
F. Field burning of agricultural residues			-	-							
G. Other (please specify)			-	-							
5. Land-use change and forestry	**106.63**	**-517.70**									
A. Changes in forest and other woody biomass stocks	-	-517.70									
B. Forest and grassland conversion	-	-									
C. Abandonment of managed lands	-	-									
D. CO_2 emissions and removals from soil	106.63	-									
E. Other (please specify)	-	-									
6. Waste			**270.90**	**0.21**							
A. Solid waste disposal on land			235.58								
B. Biological Treatment of Solid Waste			3.30	0.15							
C. Waste incineration											
D. Waste-water handling			32.02	0.05							
E. Other (please specify)											
7. Other (please specify)											
Memo items											
International bunkers	**3,590**		**0.09**	**0.08**	**17.26**	**31.29**	**4.53**	**13.35**			
Aviation	2,549		0.02	0.07	3.60	10.80	1.80	4.85			
Marine	1,041		0.07	0.01	13.66	20.49	2.73	8.50			
CO_2 emissions from biomass											

2015	CO_2 emissions (Gg)	CO_2 removals (Gg)	CH_4 (Gg)	N_2O (Gg)	CO (Gg)	NO_x (Gg)	NMVOCs (Gg)	SO_x (Gg)	SF_6 (CO_2eq Gg)	HFCs (CO_2eq Gg)	PFCs (CO_2eq Gg)
Total national emissions and removals	**66,225.39**	**-247.81**	**340.75**	**5.81**	**135.96**	**117.56**		**90.74**	**84.07**	**3,460.23**	103.07
1. Energy	**63,723.77**		**4.08**	**0.62**	**135.96**	**116.93**		**85.53**			
A. Fuel combustion (sectoral approach)	**63,723.77**		**4.08**	**0.62**	**135.96**	116.**93**		85.53			
1. Energy industries	40,173.24		0.58	0.41	9.11	71.44		69.95			

2. Manufacturing industries and construction	5,189.68		0.29	0.04	3.25	10.88		13.59			
3. Transport	17,500.49		3.08	0.16	123.33	33.25		1.60			
4. Other sectors											
Commercial, institutional	393.66		0.06	0.00	0.12	0.62		0.19			
residential sectors	366.19		0.06	0.00	0.12	0.58		0.05			
Agriculture, forestry and fishing	100.50		0.02	0.00	0.03	0.15		0.15			
5. Other (please specify)											
B. Fugitive emissions from fuels											
1. Solid fuels											
2. Oil and natural gas											
2. **Industrial processes**	**2,395.00**		**0.21**	**0.51**		**0.63**	**82.12**	**5.21**	**84.07**	**3,460.23**	113.07
A. Mineral products											
CEMENT PRODUCTION	2,233.28							0.10			
PRODUCTION OF LIME	112.98										
SODA ASH USE	15.29										
ROAD PAVING WITH ASPHALT							76.17				
Container Glass	33.46						0.90				
B. Chemical industry											
NITRIC ACID PRODUCTION				0.51		0.63					
PRODUCTION OF OTHER CHEMICALS			0.21				5.05				
Sulphuric Acid								5.11			
C. Metal production											
D. Other production											
E. Production of halocarbons and sulphur hexafluoride											
F. Consumption of halocarbons and sulphur hexafluoride									84.07	3,460.23	113.07
G. Other (please specify)											
3. Solvent and other product use											
4. Agriculture			**40.96**	**4.46**							
A. Enteric fermentation			37.85								
B. Manure management			3.11	0.64							
C. Rice cultivation			-	-							
D. Agricultural soils			-	3.83							
E. Prescribed burning of savannahs			-	-							
F. Field burning of agricultural residues			-	-							

G. Other (please specify)			-	-							
5. Land-use change and forestry	**106.63**	**-247.81**									
A. Changes in forest and other woody biomass stocks	-	-247.81									
B. Forest **and** grassland conversion	-	-									
C. Abandonment of managed lands	-	-									
D. CO2 emissions and removals from soil	106.63	-									
E. Other (please specify)	-	-									
6. Waste			**295.49**	**0.22**							
A. Solid waste disposal on land			259.30								
B. Biological Treatment of Solid **Waste**			3.89	**0.**17							
C. Waste incineration											
D.Waste-water handling			32.30	0.05							
E. Other (please specify)											
7. Other (please specify)											
Memo items											
International bunkers	**3,471**		**0.07**	**0.08**	**14.29**	**27.09**	**3.99**	**9.68**			
Aviation	2,670		**0.**02	**0.08**	3.77	11.32	1.89	5.08			
Marine	801		0.05	0.01	10.52	15.77	2.10	4.60			

2019	CO_2 emissions (Gg)	CO_2 removals (Gg)	CH_4 (Gg)	N_2O (Gg)	CO (Gg)	NO_x (Gg)	NMVOCs (Gg)	SO_x (Gg)	SF_6 (CO_2eq Gg)	HFCs (CO_2eq Gg)	PFCs (CO_2eq Gg)
Total national emissions and removals	**65,901.95**	**-389.97**	**349.79**	**5.68**	**139.24**	**85.62**		**34.29**	**117.40**	**3,967.19**	**185.31**
1. Energy	**63,845.51**		**4.52**	**0.56**	**139.24**	**85.31**		**31.63**			
A. Fuel combustion (sectoral approach)	**63,845.51**		**4.**52	**0.56**	**139.24**	85.31		31.63			
1. Energy industries	38,242.10		0.59	0.33	9.68	41.77		22.40			
2. Manufacturing industries and construction	6,133.24		0.45	0.04	6.09	10.32		7.04			
3. Transport	18,588.54		3.34	0.17	123.19	31.85		1.49			
4. Other sectors											
Commercial, institutional	376.47		0.06	0.00	0.12	0.58		0.45			
residential sectors	427.19		0.07	0.00	0.14	0.68		0.05			

Agriculture, forestry and fishing	77.97		0.01	0.00	0.02	0.11		0.20			
5. Other (please specify)											
B. Fugitive emissions from fuels											
1. Solid fuels											
2. Oil and natural gas											
2. Industrial processes	**1,949.81**		**0.21**	**0.42**		**0.31**	**82.59**	**2.66**	**117.40**	**3,967.19**	**185.31**
A. Mineral products											
CEMENT PRODUCTION	1,806.29							0.05			
PRODUCTION OF LIME	105.99										
SODA ASH USE	7.59										
ROAD PAVING WITH ASPHALT							76.17				
Container Glass	29.93						0.82				
B. Chemical industry											
NITRIC ACID PRODUCTION				0.42		0.31					
PRODUCTION OF OTHER CHEMICALS			0.21				5.61				
Sulphuric Acid								2.61			
C. Metal production											
D. Other production											
E. Production of halocarbons and sulphur hexafluoride											
F. Consumption of halocarbons and sulphur hexafluoride									117.40	3,967.19	185.31
G. Other (please specify)											
3. Solvent and other product use											
4. Agriculture			**44.19**	**4.44**							
A. Enteric fermentation			40.97								
B. Manure management			3.22	0.65							
C. Rice cultivation			-	-							
D. Agricultural soils			-	3.79							
E. Prescribed burning of savannahs			-	-							
F. Field burning of agricultural residues			-	-							
G. Other (please specify)			-	-							
5. Land-use change and forestry	**106.63**	**-389.97**									
A. Changes in forest and other woody biomass stocks	-	-389.97									
B. Forest **and** grassland conversion	-	-									
C. Abandonment of managed lands	-	-									

D. CO2 emissions and removals from soil	106.63	-									
E. Other (please specify)	-	-									
6. Waste			**300.88**	**0.26**							
A. Solid waste disposal on land			265.77								
B. Biological Treatment of Solid **Waste**			4.73	**0.**21							
C. Waste incineration											
D.Waste-water handling			30.37	0.06							
E. Other (please specify)											
7. Other (please specify)											
Memo items											
International bunkers	**4,650**		**0.10**	**0.11**	**19.61**	**36.91**	**5.42**	**26.58**			
Aviation	3,541		**0.**03	**0.**10	5.00	15.01	2.50	6.73			
Marine	1,110		0.07	0.01	14.60	21.91	2.92	19.85			

2020	CO2 Emissions (Gg)	CO2 Removals (Gg)	CH4 (Gg)	N2O (Gg)	Co (Gg)	Nox (Gg)	NMVOCs (Gg)	SOx (Gg)	SF6 (CO2e Gg)	HFCs (CO2e Gg)	PFCs (CO2 e Gg)
Total national emissions and removals	**62,780.86**	**-366.79**	**351.76**	**5.68**	**122.1**	**77.30**		**28.59**	**136.12**	**5,540.35**	**176.4**
1. Energy	**60,841.17**		**4.12**	**0.51**	**122.1**	**76.92**		**26.26**			
A. Fuel combustion (sectoral approach)	60,841.17		4.12	0.51	122.0	76.92		26.26			
1. Energy industries	37,311.82		0.59	0.30	9.64	38.22		18.84			
2. Manufacturing industries and construction	5,970.37		0.45	0.04	6.06	9.33		5.60			
3. Transport	16,758.02		2.94	0.15	106.1	28.12		1.34			
4. Other sectors											
Commercial, institutional	254.89		0.04	0.00	0.08	0.39		0.28			
residential sectors	472.84		0.08	0.00	0.15	0.75		0.05			
Agriculture, forestry and fishing	73.24		0.01	0.00	0.02	0.11		0.14			
5. Other (please specify)											
B. Fugitive emissions from fuels											
1. Solid fuels											
2. Oil and natural gas											
2. Industrial processes	**1,833.06**		**0.21**	**0.44**		**0.38**	**81.72**	**2.34**	**136.12**	**5,540.35**	**176.4**
A. Mineral products											

CEMENT PRODUCTION	1,720.29							0.06			
PRODUCTION OF LIME	100.98										
SODA ASH USE	7.25										
ROAD PAVING WITH ASPHALT							76.17				
Container Glass	4.53						0.21				
B. Chemical industry											
NITRIC ACID PRODUCTION				0.44		0.38					
PRODUCTION OF OTHER CHEMICALS			0.21				5.35				
Sulphuric Acid								2.28			
C. Metal production											
D. Other production											
E. Production of halocarbons and sulphur hexafluoride											
F. Consumption of halocarbons and sulphur hexafluoride									136.12	5,540.35	176.4
G. Other (please specify)											
3. Solvent and other product use											
4. Agriculture			**43.28**	**4.48**							
A. Enteric fermentation			40.06								
B. Manure management			3.23	0.66							
C. Rice cultivation			-	-							
D. Agricultural soils			-	3.81							
E. Prescribed burning of savannahs			-	-							
F. Field burning of agricultural residues			-	-							
G. Other (please specify)			-	-							
5. Land-use change and forestry	**106.63**	**-366.79**									
A. Changes in forest and other woody biomass stocks	-	-366.79									
B. Forest and grassland conversion	-	-									
C. Abandonment of managed lands	-	-									
D. CO2 emissions and removals from soil	106.63	-									
E. Other (please specify)	-	-									
6. Waste			**304.16**	**0.26**							
A. Solid waste disposal on land			269.91								
B. Biological Treatment of Solid Waste			4.56	0.20							
C. Waste incineration											
D.Waste-water handling			29.69	0.06							
E. Other (please specify)											
7. Other (please specify)											
Memo items											
International bunkers	**2,515**		**0.09**	**0.05**	**17.94**	**29.64**	**4.13**	**5.97**			
Aviation	1,288		0.01	0.04	1.82	5.46	0.91	2.45			
Marine	1,227		0.08	0.01	16.12	24.18	3.22	3.52			

Mitigation Policies and Actions

Key developments since the last National Communication

- In July 2021, Israel submitted an updated NDC under the Paris agreement which includes an unconditional absolute GHG emissions reduction goal of 27% relative to 2015 by 2030 (58 MtCO2e) and 85% relative to 2015 (12 MtCO2e) by 2050.
- At COP 26 in Glasgow, Israeli Prime Minister Naftali Bennett declared that Israel would seek to attain net zero carbon emissions by 2050.
- The updated targets mark a significant increase in ambition relative to Israel's previous NDC that included a per capita target for 2030, which at the time was projected to correspond to approximately 81 MtCO2e in 2030 - some 40% more than the updated target. The new NDC includes sectoral GHG emissions reduction targets for 2030 and 2050 for the power, transport, industry, and waste sectors.
- Israel's National GHG Reduction Plan (2016-2022) reduced emissions by 10 MtCO2e relative to BAU levels, primarily through phasing down of coal-fired electricity generation (7.4 MtCO2e), increased power generation from renewables (0.8 MtCO2e) and energy efficiency (0.7 MtCO2e).
- In October 2021, Israel published an updated National Action Plan on Climate Change (2022-2026) to bridge the gap between achieved emission reductions and its 2030 emission targets. The implementation plan includes 100 economy-wide and sectoral measures regarding mitigation, adaptation, finance and investment, and reporting.
- Key sectoral measures for the coming decade include:
    - Carbon pricing on fossil fuels, to be implemented through the existing excise tax mechanism, as per Government Decision 286 (2021).
    - A complete phase-out of coal-fired electricity generation no later than 2026, as per Government Decision No. 465 (2020).
    - Updated targets for renewable electricity generation to amount to 20% of electricity consumption by 2025 and 30% by 2030, as per Government Decision No. 465 (2020).
    - A target to cap landfilling at 20% of municipal solid waste by 2030, with zero landfilling of untreated organic waste, paper and cardboard, as per the National Waste Strategy (2021).
    - Reducing the GHG emission intensity of new cars and light commercial vehicles to 5% of 2020 levels, by 2030.
    - Reducing emissions from HFC consumption in line with Israel's commitments under the Kigali Amendment to the Kyoto Protocol.
- In 2016, the national system for Monitoring, Reporting and Verification (MRV) was established and in 2018 the first monitoring report was submitted to Government.
- MRV data estimates the total GHG emissions of Israel for 2021 to 76.6 MtCO2e.

Israel's INDC and National GHG Reduction Target for 2030

In July 2021 Israel submitted an updated NDC under the Paris Agreementwhich included for the first time, an unconditional, absolute economy-wide emission reduction target of 27% relative to 2015 levels by 2030 (58 MtCO2e) and 85% relative to 2015 levels by 2050 (12 MtCO2e). The new targets were approved by Government on July 25 2021 (Government Decision 171: Transition to a Low-Carbon Economy) and entailed a significant increase in Israel's level of ambition, as Israel's previous NDC included a per capita emission target expected at the time to correspond to approximately 81 MtCO2e in 2030 - some 40% more than the updated target. Additionally at COP 26 in Glasgow, Israeli Prime Minister Naftali Bennett declared that Israel would seek to attain net zero carbon emissions by 2050.

The updated NDC also includes the following sectoral targets:

Table 18: 2030 Sectoral Targets

Sector	2030 GHG Target	Supporting Targets
Power Generation	30% reduction relative to 2015 (26.3 MtCO2e)	Phase-out coal-fired power generation by 2026 30% renewable generation by 2030*
Waste (excl. wastewater)	47% reduction relative to 2015 (2.9 MtCO2e)	Reduction from 80% landfilling of MSW in 2020, to only 20% by 2030, with zero landfilling of untreated organic waste, paper and cardboard
Transportation	3.3% increase relative to 2015 (18.18 MtCO2e)	95% in GHG emission intensity of new cars and light commercial vehicles, relative to 2020; As of 2026, 100% of new municipal buses purchased will be clean vehicles as defined in section 77A of the Transport Ordinance [New Version]
Industry	30% reduction relative to 2015 (8.4 MtCO2e)	Reduction of industrial gas emissions in line with the Kigali Amendment to the Montreal Protocol
Final Energy Intensity (non-GHG target)	122 MWh per NIS 1 Million GDP*	N/A

*Replaces the previous target of 17% renewable power generation by 2030

**Replaces previous target of 17% reduction in electricity demand relative to BAU levels

Targets – current status

Table 19: Israel's progress in meeting its 2020, 2025 and 2030 primary GHG targets

National Target	2015	2017	2018	2019	2020 (Latest Reported Value)	2021 (Estimated value)*	2030 (Target Value)	2050 (Target Value)
National GHG Emissions ($MtCO_2e$)	79	78	78	79	77	76.6	58	12

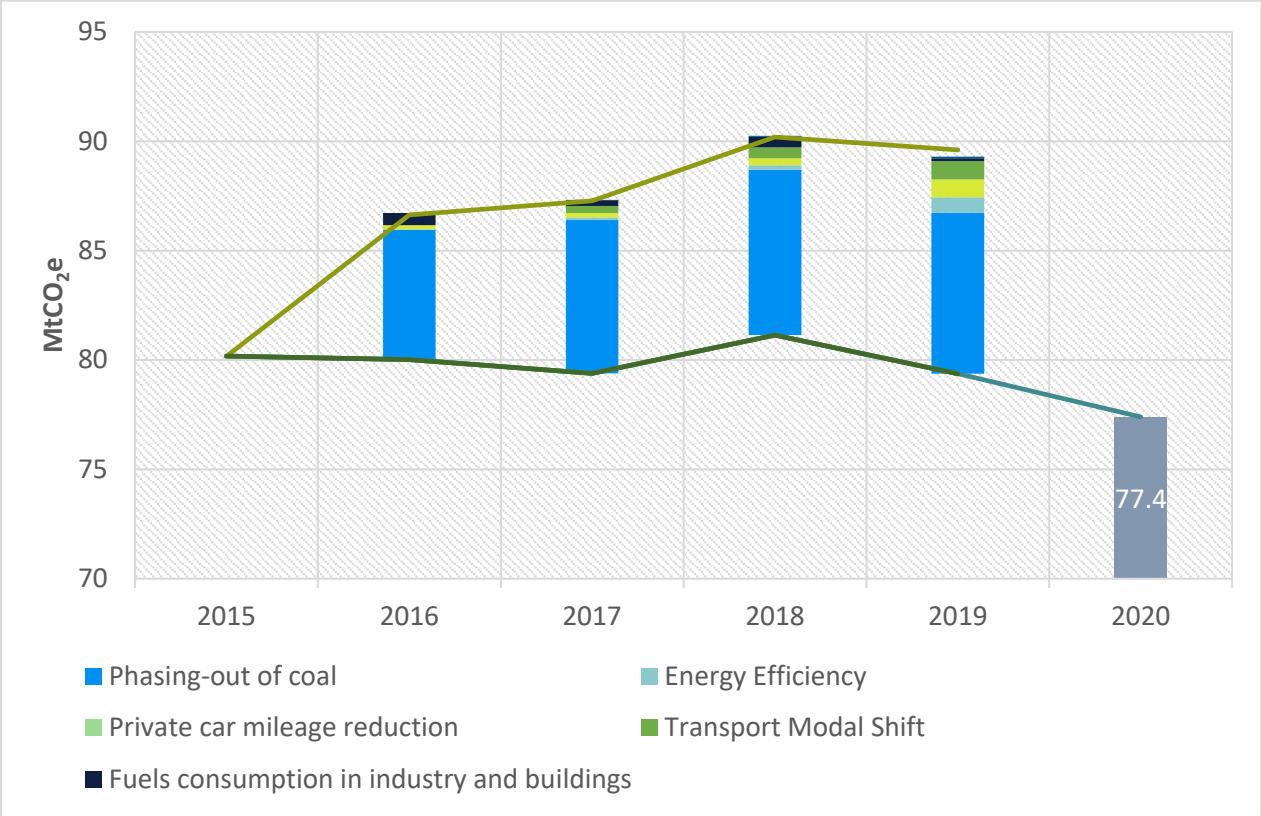
*Based on initial data - MRV.

National GHG Emissions Reduction Plan, 2016-2021

In April 2016, the government approved a National Plan to Reduce GHG Emissions and Increase Energy Efficiency to achieve its 2020, 2025 and 2030 targets, and in September 2016, the National Plan for the Implementation of the Paris Agreement was published.

As of 2019, the plan had achieved a total emission reduction of approximately 10 MtCO2e, relative to BAU levels. Figure 40 shows the contribution of the key abatement measures to the reduction achieved in 2019, considering policies implemented as of the reporting date.

Figure 31: Key mitigation measures – existing policies implemented



Description of implemented mitigation actions

Phasing-down coal-fired electricity generation

In accordance with the Ministries of Energy and Environmental Protection agreement to reduce generation in existing coal-fired power plants, all coal units have been operating since the end of 2016 at the minimum possible load that would still enable generation system flexibility and reliability of the electricity supply. This abatement measure reduced coal-fired power generation by 40% relative to BAU levels in 2019, the last reporting year, and has been responsible for the majority of annual emission reductions achieved since approval of the National GHG Emissions Reduction Plan in 2016 – with a reduction of 7.4 MtCO2e in 2019.

Electricity generation from renewable energy

Electricity generation from renewable energy amounted to 6.0% of the total electricity generation in 2020, and increase from 4.9% in 2019. By the end of 2019, total renewable electricity generation amounted to approximately 3.3 TWh – an increase of some 2 TWh relative to the BAU levels of 1.3 TWh in 2015. Of the total renewable capacity of approximately 2,200 MW, 86% was solar PV, while more than half (1,216 MW) was added in 2018 and 2019. Renewable electricity generation reduced 0.8 MtCO2e emissions in 2019, relative to BAU levels.

Energy Efficiency

Israel's efforts towards energy efficiency in electricity consumption reduced total electricity consumption in the country by approximately 0.76 TWh, to 67.1 TWh in 2019, reducing GHG emissions by 0.7 MtCO2e.The key efficiency measures included:

1. *Approval of the Planning and Building Regulations update (Building Design) regarding the supply of hot water in residential buildings*. In November 2018, the Knesset Construction and Regulations Subcommittee approved regulations requiring the installation of efficient water heating systems in all new buildings, including high-rise residential buildings. This update replaces the old regulation which required solar-thermal water heating for the top seven floors only.
2. *Government grants for energy efficiency.* Since 2018, the government has continued to budget two grant programs:

   → National Support Mechanism for projects for energy efficiency and reduction of greenhouse gas emissions (Government Decision 1403) (2016 – 2019). The program is jointly managed by the Ministries of Environmental Protection, Economy and Industry, Energy and Finance. In addition to its energy efficiency and emission reduction goals, the program promotes projects implemented by local authorities with low socio-economic rankings and by small and medium-sized enterprises, as well as projects with co-benefits such as industrial air pollution reduction and uptake of new Israeli technologies.

   The grants are awarded to energy efficiency and other emission reduction projects through a tendering process based on the amount of funding requested per tCO_2e reduced. The methodologies for assessing these projects, as well as their impact on GHG emissions, were developed by the Ministry of Environmental Protection based on relevant methodologies approved by the UNFCCC CDM Executive Board.

   → Energy efficiency grants in southern communities - local authorities, industrial plants and commercial institutions (Government decision 2025) (2016 – 2019). The program is managed by the Ministry of Energy.

   These two programs totaled NIS 153 million (approx. $49.3 million), leveraging NIS 660 million (approx. $213 million) in private investment:

Program	Amount invested - 2018 (NIS million)	Amount invested - 2019 (NIS million)
National Support Mechanism for Energy Efficiency and Emission Reduction projects	83,477 (approx. $26,900 million)	63,744 (approx. $20,540 million)
Energy Efficiency Grants for Local Authorities	1,807 (approx. $582 million)	3,900 (approx. $1,260 million)

These investments were added to the NIS 240.9 million (approximately $77.6 million) reported in Israel's Third National Communication published in 2018:

Program	Amount invested
National Support Mechanism for Energy Efficiency and Emission Reduction projects	NIS 157.6 million (approximately $50.8 million), leveraging an estimated NIS 600 million (approximately $193 million) in private investment.
Energy Efficiency Grants for Local Authorities	NIS 77.7 million (approximately $ 25 million), leveraging further investments of NIS 147 million (approximately $47.3 million).
Energy Efficiency Grants	NIS 5.6 million (approximately $1.8 million), leveraging further investments totaling NIS 12.1 million (approximately $3.9 million).

Avoided landfilling of municipal solid waste

The Ministry of Environmental Protection, in conjunction with local authorities, has implemented a variety of measures aimed at reducing the landfilling of municipal solid waste (MSW), including increased separation-at-the-source infrastructure, waste transfer stations with separation technology, and construction of treatment facilities. The resultant avoided landfilling reduced GHG emissions by 72,000 tCO2e in 2019; however, as emissions from landfill waste occur over a number of decades after the waste is landfilled, the overall contribution to reducing GHG emissions is much higher.

Switching to natural gas in industry

On October 22, 2017, Government Resolution 3080 was issued for "accelerating the use of natural gas and reducing air pollution" as a replacement for the use of heavy fuel oil in the industry sector. Switching to natural gas led to a reduction of 72,000 tCO2e in 2019.

Improved GHG intensity of vehicles

The continued improvement in the GHG intensity of vehicles has also contributed to the reduction in emissions (0.8 MtCO2e in 2019). While some of this reduction is due to improvements in the GHG intensity of new vehicles manufactured abroad, Israel has taken action to improve the GHG intensity of vehicles actually purchased, including through green taxation schemes on new vehicle purchases and support measures for electric urban buses.

National Action Plan on Climate Change, 2022-2026

In October 2021, Israel published an updated National Action Plan on Climate Change (2022-2026). The implementation plan includes 100 economy-wide and sectoral measures regarding mitigation, adaptation, finance and investment, and reporting.

The plan is designed to bridge the gap between emission reductions already achieved and the reduction required to meet Israel's updated NDC GHG reduction target for 2030, as well as to facilitate the required reductions to meet Israel's target for 2050.

The expected emission reductions by sector are detailed below.

Figure 32: 2030 emissions reduction by sector relative to 2015

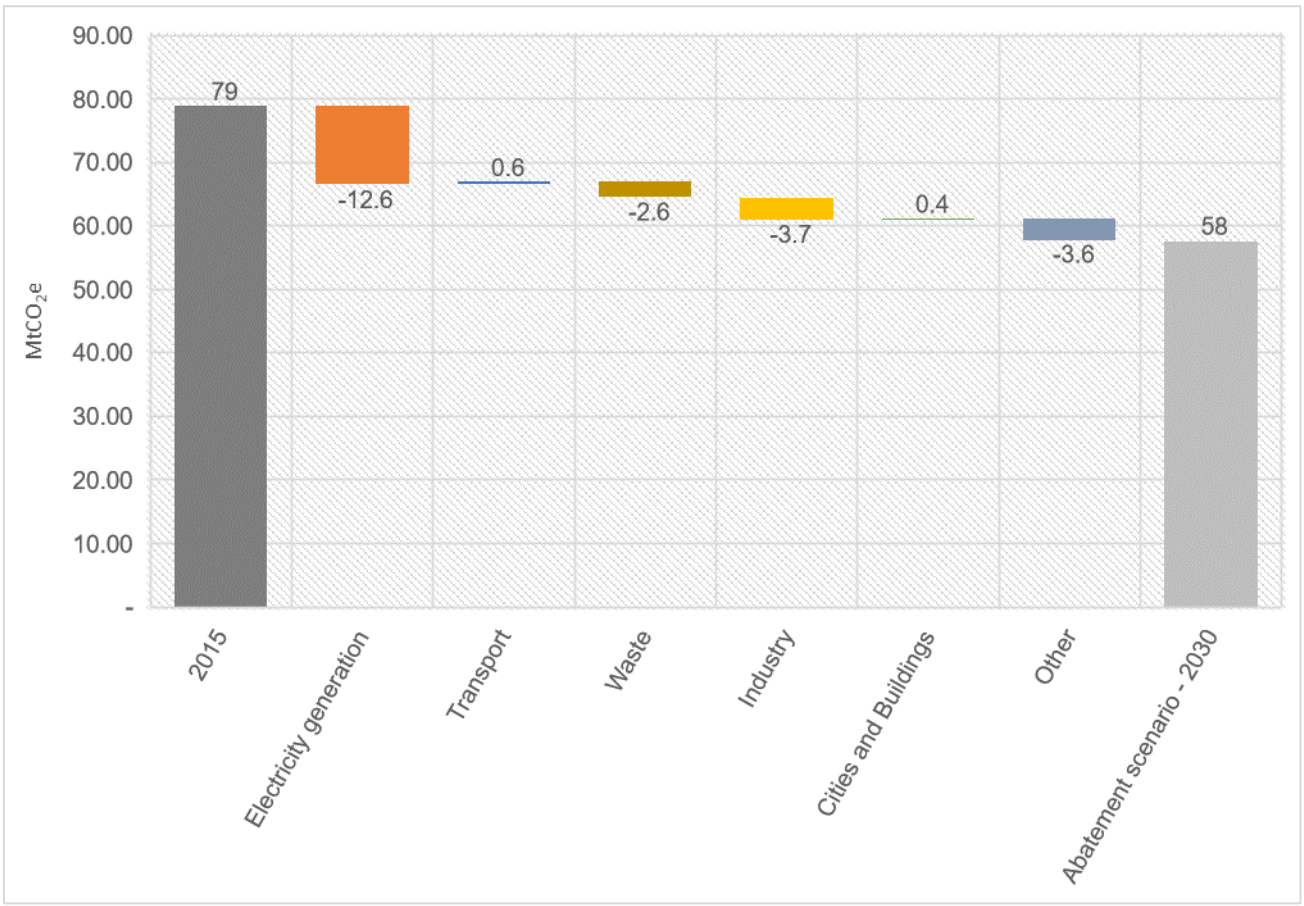
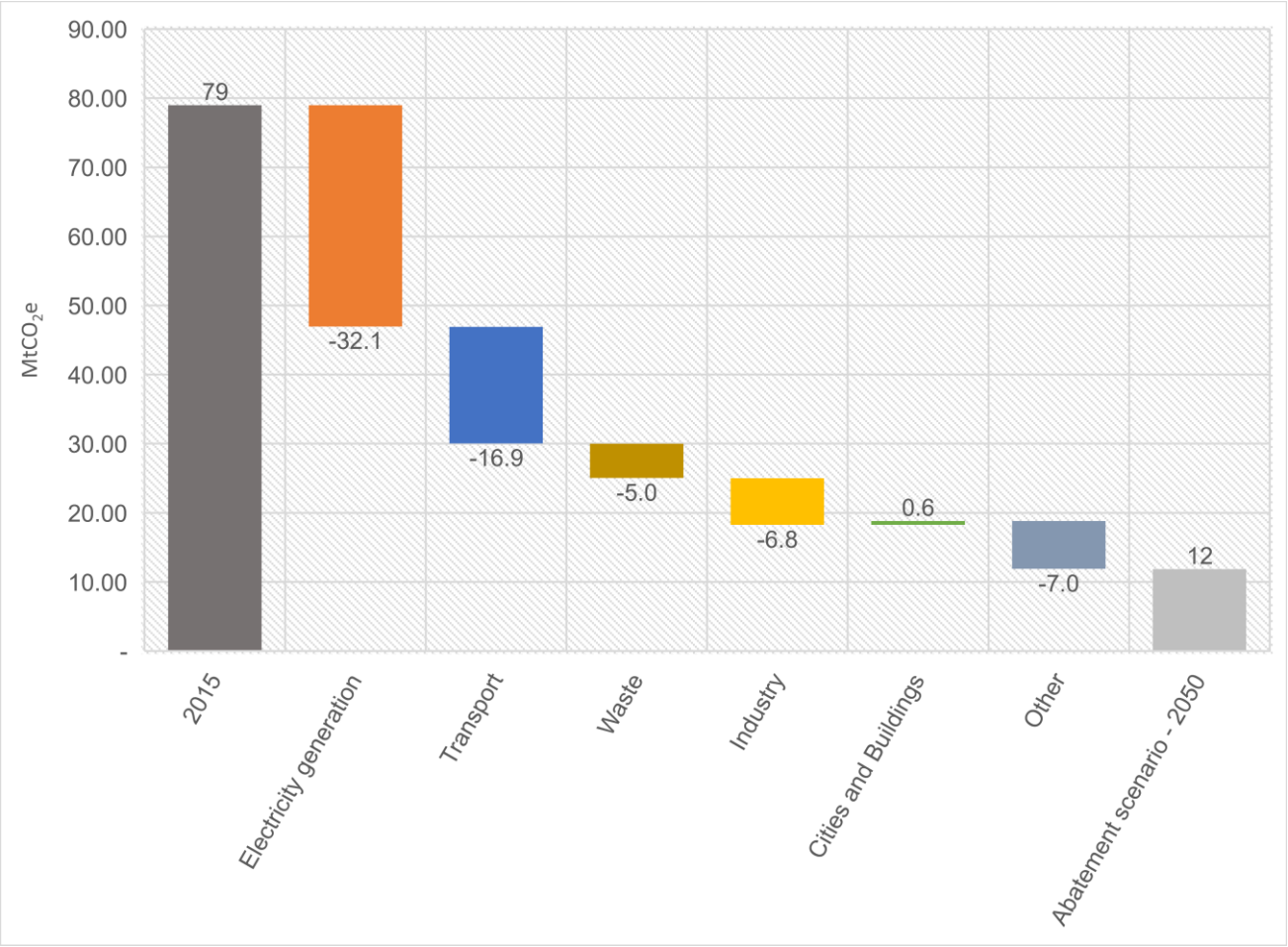


Figure 33: 2050 emissions reduction by sector relative to 2015



Summary of Mitigation Plan – Key Abatement Measures

Energy

Complete phase-out of coal-fired power generation by 2026

Israel aims to completely end the use of coal-fired power generation by 2026, in accordance with two key government decisions:

1. *Decommissioning of 30% of coal-fired units by 2022 (Government Decision No. 4080, 2018)*: Israel will decommission units 1-4 at the Orot Rabin power plant by June 2022. These four units account for approximately 30% of Israel's coal power generation capacity.
2. *Complete phase-out of the remaining coal units by 2026 (Government Decision No. 465, 2020)*: On November 24, 2019, the Ministry of Energy laid out policy principles regarding the phasing-out of coal use for electricity generation by 2026. In accordance with the *Electricity Sector* Law, the Minister of Energy has determined a gradual phasing out of coal by 2025 – and no later than 2026 – by retrofitting generation units 5-6 at the Orot Rabin power plant and units 1-4 at the Rotenberg power plant to natural gas. The decision to phase out coal was formalized in Government Decision

No. 465 (2020), which specified that 70% of the electricity generation in 2030 would be fueled by natural gas (with the remainder generated by renewables).

Increase renewable-based electricity generation, with a focus on dual-use

Due to the fact that Israel has limited land resources, the target will be met with a strong focus on distributed generation on dual-use structures in built areas (such as a potential mandate for solar PV on new buildings). Other measures include promoting energy storage in planning and regulations, formulating an updated grid development plan, and experimenting with agro-voltaic systems which integrate PV electricity generation with farming.

Further, Israel will seek to connect its electricity grid to that of neighboring countries and purchase renewable electricity generated from them. In November of 2021, Israel signed a Memorandum of Understanding with Jordan, a country with an abundance of open desert land that lends itself well to Solar PV energy, but maintains a deficiency in clean drinkable water. The proposed deal stipulates Israel will receive 600 MWs of Solar PV energy from Jordan, in return for an export of 200 million cubic meters of desalinated water.

Sustainable Energy Grants

To meet the national reduction target, the government has budgeted additional grants for sustainable energy and greenhouse gas reduction projects, whilst protecting the competitiveness of Israeli industry, including energy efficiency, electrification of processes, demand-shift and energy storage. The budget includes a total of NIS 450 million (approx. USD 145 million) for the years 2022-2026, NIS 350 million of which shall be allocated to industry and NIS 100 million of which shall be allocated to the business sector and local authorities.

In addition, the government has budgeted NIS 145 million (approx. USD 46.7 million) for the years 2022-2024 to promote sustainable energy and climate change adaptation in local authorities.

Green and Zero-Energy Buildings

In August 2020, the Green Building Standard (T.I. 5281) and the Planning and Building Regulation (Sustainable Buildings) were signed and published, requiring all new construction in Israel to meet at least the first level of the Israeli Green Building Standard. This regulation will take effect gradually from March 2022, in accordance with the designation of the building (residential construction under construction that is not adjacent to the land, offices, hotels and more).

Further, as per Government Decision 171 (2021), targets for zero-energy construction in new buildings were to be determined by mid-2022; however, government is also considering mandating PV in new buildings in conjunction with the Green Building Standard as an alternative to Zero-Energy Building mandates.

Transportation

Transition from private vehicle use to sustainable transport

At the end of 2017, the Ministry of Transport formulated an investment plan for public transportation infrastructure that includes among others, a strategic plan for the development of the national rail network for 2040, strategic plans for public transportation systems in the Tel Aviv metropolitan area, the Jerusalem metropolitan area and the Haifa metropolitan area, dedicated public transportation lanes on intercity roads, and investment in bicycle and pedestrian infrastructure. According to recent projections received from the Ministry of Transport, full implementation of the strategic plans will result in a 10% reduction in private travel in 2025 and a 15% reduction in 2030, relative to the reference scenario.

Development of mass transport infrastructure in metropolitan areas will be funded with a budget of NIS 250 billion by 2035 (approx. USD 80.6 billion). A budget of NIS 6 billion (approx. USD 1.9 billion) has been allocated to promote urban public transport lanes by 2026, and a budget of NIS 400 million (approx. USD 128.9 million) has been allocated for development of 2,000 kilometers of bicycle infrastructure. An additional budget of NIS 2.5 billion (approx. USD 0.8 billion) by 2026 has been allocated to improve public transport bus services with focus on demand and a corresponding level of supply.

Transition to zero emissions vehicles

Israel is promoting the transition to zero-emissions transport, with a focus on cars and light commercial vehicles, urban buses, and trains. Government is promoting the distribution of charging infrastructure in new buildings, apartment buildings and public spaces, with NIS 60 million (approximately USD 19.3 million) allocated for charging infrastructure for electrified transport. In addition, the government provides support for purchase of zero-emission buses and electrification of terminals, and Israel is currently in the process of electrifying its entire passenger train network.

Industry

Reduction in the use of fossil fuels

As detailed above, government has allocated an additional budget for grants to support energy efficiency, GHG emission reductions, and transition to clean energy sources in industry, including integration of new technologies based on zero-emission energy, such as electrification and hydrogen.

Transition to green refrigerants

In November 2020, the Internal Affairs and Environment Committee of the Knesset amended the Hazardous Materials Regulations to set quotas on the import of HFC cooling gases, in line with Israel's targets under the Kigali Amendment to the Montreal Protocol. These regulations came into effect in July 2022.

Waste

In February 2021, the Ministry of Environmental Protection published a new National Strategy for a Circular Economy in 2050 and a Sustainable Waste Sector in 2030. The strategy addresses treatment of Municipal

Solid Waste (MSW) in a comprehensive manner, and includes several key abatement measures in relation to sources of GHG emissions.

Promote recycling

To this end, government has budged NIS 2.4 billion (approximately USD 0.7 billion) in support for waste sorting and organic waste treatment facilities and NIS 850 million (approximately USD 274 million) in support for separation at source of organic waste.

Prevention of Landfilling

The national Waste Strategy includes a revision of the landfill levy, as well as a potential levy on waste incineration, to reflect the externality costs of associated emissions, and in addition a ban on landfilling of unsorted waste and untreated organic waste, to be imposed by 2030. Further, the government has allocated NIS 1.2 billion (approx. USD 0.4 billion) in support for waste-to-energy infrastructure to treat residual waste.

Waste reduction at the source

Key measures to reduce the quantity of waste generated include development of a national plan to reduce food waste, and support for pilot projects to reduce the amount of municipal waste generated in households.

Landfill gas collection and utilization

All active landfills will be sealed, and methane collection and destruction/utilization systems shall be installed, such that methane collection shall be no less than 50% of total methane production in a landfill by 2030.

Economy-wide measures

Climate Legislation

Israel intends to pass climate legislation which shall determine mechanisms and bodies to ensure the capacity of the State of Israel to reduce GHG emissions and prepare for climate change, such as the establishment of a ministerial committee that will be assisted by an advisory committee, an academic committee of experts, and public stakeholders.

Carbon Pricing

As per Government Decision No. 286 (2021), Israel will implement carbon pricing on fossil fuels through the existing fuel excise tax mechanism. The carbon price will gradually increase until full implementation in 2028.

Financing and Investment

Israel has launched a joint regulatory forum for improving environmental financial regulation with emphasis on adjustments in line with EU regulation, and is currently in the process of formulating an Israeli financial taxonomy system based on the one developed in the European Union, with the aim of providing transparency with regards to the impact of economic activities on the environment in general, and climate change in particular.

Further, government ministries are working with the financial regulators on internalizing investment and financing risks due to climate change.

Climate Innovation

Israel will incentivize integration of locally-developed technologies in Israel, including a mutual track for pilot projects between the Ministry of Environmental Protection and the Israel Innovation Authority with an investment of NIS 15 million each year (approximately USD 4.8 million), and a funding track from the Ministry of Energy with an investment of NIS 35 million (approximately USD 11.3 million). Further, Israel is in the process of establishing an international innovation center for climate change with emphasis on the desert environment (DeserTech).

Detailed information on mitigation actions currently monitored under Israel's MRV system is provided in the following table. The MRV system is being updated to reflect the new implementation plan:

Name of Mitigation action	Progress of Implementation (Start year-end year)	Steps taken/planned to achieve the action	Investment allocated to **mitigation actions** (Government and private)	Quantitative goals	Progress indicator and unit	Indicator value in the last reporting year (2019)	Estimated reductions in the last reporting year (2019)	Estimated reductions in 2030
Phasing-out coal-fired electricity generation	2016 - ongoing	1. Operating coal plants at the minimum possible load whilst still ensuring flexibility of generation and reliability of electricity supply. 2. Closure of four old coal units with a capacity of 1440 MW by 2022 and replacing them with NG combined cycle units. 3. Phasing-out of coal generation by 2026.	Government Investment: N/A	1. 15% reduction of coal use compared to 2015 (until 2021) 2. Closure of 1440 MW coal-fired units by 2022 3. Complete Phase out by 2030	Actual reduction rate of electricity generation in the coal units in reporting year, compared to 2015 (%)	39%	7.4 $MtCO_2e$	17 $MtCO_2e$
Renewable electricity	2016 - ongoing	1. Approval and update of renewable energy feed- in tariffs (based both on fixed tariff and tariff tenders) 2. Removal of financial, regulatory and statutory barriers	Government investment: data not available Private investment: data not available	10% renewable electricity generation by 2020, 20% until 2025 and 30% until 2030.	% of electricity consumption from renewables	6.1% (2020)	0.8 M tCO_2e Emission reduction is relative to 2015 generation, (reference scenario).	10.7 $MtCO_2e$
Emissions reductions in buildings	2016-ongoing	Approval of Green Building regulations and amendment of the Planning and Building Regulations (Sustainable Construction)	Government investment: Data not available Private investment: Data not available	N/A	Annual electricity savings (MWh/ year)	46 GWh	0.02 MtCO2e	0.8 MtCO2e

Government Grants for Sustainable Energy	2016-ongoing	1. National Support Mechanism for projects for energy efficiency and reduction of greenhouse gas emissions (Min. of Environmental Protection) 2. Energy Efficiency Grants for Local Authorities (Min. of Environmental Protection) 3. Energy Efficiency Grants (Min. of Energy)	Government Investment: NIS 1,000 million (approximately $300 million) Private investment (as of 2019): NIS 1,419 million (approximately $400 million)	N/A	Annual electricity savings (MWh)	0.15 TWh	0.064MtCO2	--
National Transport Sector Plan	2018-ongoing	1. Mass transport infrastructure 2. Urban public transport lanes 3. Bicycle infrastructure 4. Improved public transport service	Government investment: Data not available Private investment: Data not available	Reduce annual average private car mileage per capita to 5,000 km by 2030	Annual private car mileage: vehicle-km/capita.	Approx. 5,500	No significant reductions have been measured to date	2.2 MtCO2e
Avoided Landfilling of MSW (2016-2020) The National Strategy for a Circular Economy in 2050 and a Sustainable Waste Sector in 2030 (2020 onwards)	2016-ongoing	1. Support for waste sorting and organic waste treatment facilities 2. Support for separation at the source of organic waste 3. Revision of landfill levy 4. Ban on landfilling untreated organic waste, paper and cardboard (2030)	Government Investment: data not available Private investment: data not available	•47% reduction in solid waste disposal emissions relative to 2015 (2.9 MtCO2e) •Transition from 80% of waste landfilling in 2020, to only 20% by 2030; •Zero	GHG reduction relative to 2015	1.3%	0.072 MtCO2e	2.5 MtCO2e

		5. Collection and utilization of at least 50% of methane at active landfills		landfilling of untreated organic waste and paper and cardboard by 2030				
HFC Reduction (Kigali Amendment)	2019-ongoing	Implementation of Kigali amendment - Approval of hazardous waste amendment	Government Investment: N/A Private investment: data not available	Set by Montreal Protocol and Kigali Amendment Allowed import according to Kigali amendment (tCO2e) 2024: 3,922,538 2029: 1,961,269 2034: 1,307,513 2039: 980,635	Ton HFCs consumed (tCO2e)	6,810,777 tCO2e	0	5.3 MtCO2e
Natural gas fuel switch in industry	2016 - ongoing	Government Resolution 3080 to accelerate the use of natural gas in the industry and reduce air pollution.	Government Investment: data not available Private investment: data not available	N/A	Tons of HFO replaced with NG	Approx. 90,000 tons	0.072 MtCO2e	0.4 MtCO2e

Decision making and monitoring processes

NDC update and Israel 2050 vision

Israel's NDC update and long-term low carbon development goals were developed in a broad, multi-stakeholder process over the course of 2019 and 2020, which was led by the Ministry of Environmental Protection, in conjunction with the Israel Democracy Institute, the OECD and key Ministries – Energy, Transportation, Economy, The Planning Administration. In order for the process to be based on a holistic approach, four sectoral work teams as well as a macroeconomic team and a social impacts team (including many stakeholders of the Israeli society) were established. This work approach is based on the experience reviewed in other OECD countries that have completed the formulation of their vision and strategy for a low-to-zero carbon economy.

As explained in further detail in the Institutional Arrangements section in Chapter 1 (National Circumstances) the decision-making process going forward is supported by the Inter-ministerial Steering Committee for GHG Emissions Reductions, which consists of representatives from all relevant government ministries and advisory bodies. The Steering Committee submits an annual report to the government evaluating the effectiveness of government measures to reduce emission reductions, the progress towards meeting national GHG emission reduction targets and supporting targets, and recommending additional measures as needed.

Monitoring of GHG emission reductions

The National Plan to Reduce GHG Emissions and Increase Energy Efficiency (2015-2021) established a national system for monitoring and reporting, relating to the implementation of national targets for reducing greenhouse gas emissions.

Israel monitors emission reduction on both a national and a policy level in accordance with the national Monitoring, Reporting and Verification (MRV) system.

The MRV system was implemented in 2016 by the Ministry of Environmental Protection in cooperation with government ministries and other relevant statutory bodies, and operates on the basis of guiding principles of the UN Climate Convention and on the basis of methodologies developed in accordance with the characteristics of the Israeli economy. It is managed by the Ministry of Environmental Protection, on behalf of the Steering Committee, and produces the following annual outcomes:

1. *Reference Scenario Emissions until 2030*: The reference scenario reflects expected GHG emissions in the absence of government reduction measures implemented after 2015 – the year in which Israel committed to its mitigation goals as part of the Paris Agreement.
2. *Policy Measure Impacts*: Within the MRV system framework, both achieved (ex-post) and expected (ex-ante) emission reductions are monitored for key policy measures. The expected reductions are calculated for each of the target years (2020, 2025 and 2030), for two levels of implementation:
    a. Implementation of the policy measure to the extent that it has already been approved (but not necessarily fully implemented)
    b. Implementation in accordance with approved sectorial targets.

    In addition, some non-GHG impacts are also monitored, including the economic impacts of the measures.

3. *Abatement Scenario Emissions*: Abatement scenario emissions are forecasted for each of the target years and each of the abovementioned three levels of implementation.

The MRV system facilitates the following:

- Measurement of national progress towards achieving mitigation goals.
- Measurement of the effectiveness of specific government GHG reduction policies and actions.
- Revision and expansion of the policy actions to maximize the achieved economic and environmental benefits.
- Fulfillment of reporting obligations to the UN on mitigation actions by Israel and their effects.
- Transparency of information on Israel's progress towards achieving its reduction goals.

The monitoring is conducted on the basis of approved government methodologies, which define the calculation methodology, the parameters to be monitored, and the requisite QA/ QC procedures. The methodologies also define the manner in which overlapping effects between different government measures are accounted for in order to avoid double counting.

As mentioned above, the MRV system is currently being revised to reflect both the updated National Climate Action Plan (2022-2026) as well as new guidelines regarding the Enhanced Transparency Framework.

Financial, Technology, and Capacity Building Needs and Support Received

Key Developments

- No assistance was received to prepare this Biennial Update Report
- There are knowledge gaps and capacity needs related to the preparation of a national emissions inventory report, as well as regarding the methods and resolution for calculation of specific emission sources, such as agriculture, energy, solvent and other product use.
- Since the Third National Communication report, two climate change-related workshops have been conducted in Israel with the aid of international funding.
- Israel continues to assist developing countries in climate change-related issues, especially agriculture and water. In 2018-2019, 4,113 delegates participated in courses conducted in Israel and 2,729 participated in courses held by Israel abroad.

Despite its status as a non-Annex I country, Israel is an OECD member state, and receives little climate change related international aid. Israel provides aid to a number of countries and is actively involved in the international climate community. Israel participates in a number of technology transfer and international development activities; bilateral climate cooperation activities; and international cooperation on climate change. Many countries have benefited from the State of Israel's technology transfers, in particular developing countries and countries in Africa.

Constraints and gaps, and related financial, technical and capacity needs

Israel has identified the following capacity-building needs related to the facilitation of the preparation of subsequent BTRs and participation in review mechanism:

a. Further enhancing capacity regarding certain aspects of the national inventory report (NIR), including conducting the uncertainty analysis and estimating emissions from fuel combustion using the reference approach, as well as comparison to the sectoral approach, due to a combination of a lack of resources and knowledge gaps. The key category analysis has been partially conducted but not published.
b. Specific data gaps and improvements needed:
    - Agriculture: Data gaps regarding agricultural residues continue to pose a challenge, and no calculations were conducted for lime and urea application due to uncertainty as to the relevance of this emission source for Israel.
    - Energy: There is good data coverage of fuel consumption, yet an improvement is required in estimating the distribution of consumption in the residential, commercial and agricultural sectors.
    - Solvent and Other Product Use: Data gaps and lack of a calculation methodology pose a challenge in calculating emissions from this source.

Support Received and Information on BUR preparation support

Israel does not need to receive international support related to the preparation and submission of the BUR.

The following is a list of projects related to climate change for which Israel received international support:

- TAIEX - Multi Country Workshop on Sustainable Water Management and Water Reuse. Two Israeli representatives participated in the workshop which took place in Jordan. All flights and per diem expenses were covered by the program.
- EU ClimaMed – The ClimaMed project supports climate change mitigation and adaptation in 8 South Mediterranean countries, including Israel. The project is provided by the European Neighborhood Policy (ENP). Its overall objective is to enhance energy security and adaptive capacity of partner countries while increasing energy sovereignty and reducing CO2 emissions. Climate finance is also a key component. The project sponsored a workshop for Israeli local authorities on climate change mitigation and adaptation. The 6-month workshop was initiated in 2019 with a budget of approximately €0.5 million, including funding for advisors. It provided 40 participants from local authorities in Israel with an understanding of Israel's reduction targets, guidance for building local Baseline Emission Inventories and a Sustainable Energy Access and Climate Action Plans (SEACAP), knowledge on urban sustainability, capacity building, citizens awareness raising, and more. The program also encourages local authorities to join The Global Covenant of Mayors for Climate & Energy, which is an international coalition of mayors and city officials committed to reducing greenhouse gas emissions, enhancing resilience to climate change and tracking their progress publicly.

International Development (MASHAV and KKL-JNF) [69] [70]

Israel has a long history of international cooperation with respect to technology, knowledge transfer, and capacity building. The main organizations in Israel engaged in these processes are MASHAV (Israel's Agency for International Development Cooperation, a division of the Ministry of Foreign Affairs) and the Keren Kayemeth LeIsrael – Jewish National Fund (KKL-JNF). MASHAV is in charge of implementing the State of Israel's international development cooperation program and operates according to international agreed standards and principles. MASHAV focuses its efforts on capacity building and technology transfers, sharing relevant expertise accumulated during Israel's own development experience to contribute to reducing poverty and to promoting sustainable development. MASHAV's activities include implementing projects abroad and professional training programs on a variety of topics, both in Israel and in situ. Participants in courses held in Israel typically stay between three weeks to five months. In situ courses are generally two to four weeks.

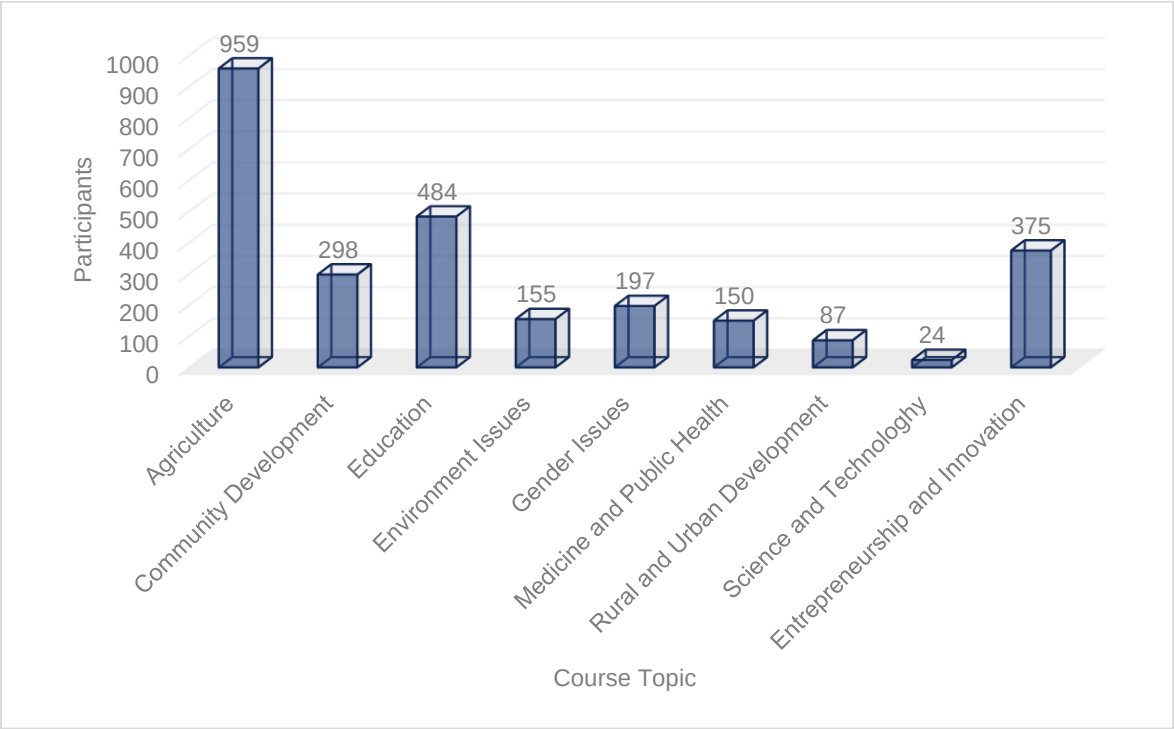
Since its establishment in 1958, more than 30,000 professionals from 150 countries have participated in MASHAV seminars, courses and conferences in Israel. In addition, through courses and long-term projects

[69] "MASHAV Annual Report", Ministry of Foreign Affairs, 2019
[70] "Implementation of the Sustainable Development Goals", Israel, 2019

held abroad, MASHAV reaches out to thousands of professionals and hundreds of organizations around the world. In 2018-2019, 2,729 professionals from 132 countries participated in 135 courses offered in Israel. In addition to courses, MASHAV staff members are deployed internationally as short- and long-term consultants. In 2018-2019, staff participated in 120 short-term consultancy projects in 43 countries. There are also a handful of experts living and working abroad on longer-term projects. MASHAV is well known for its international development projects.

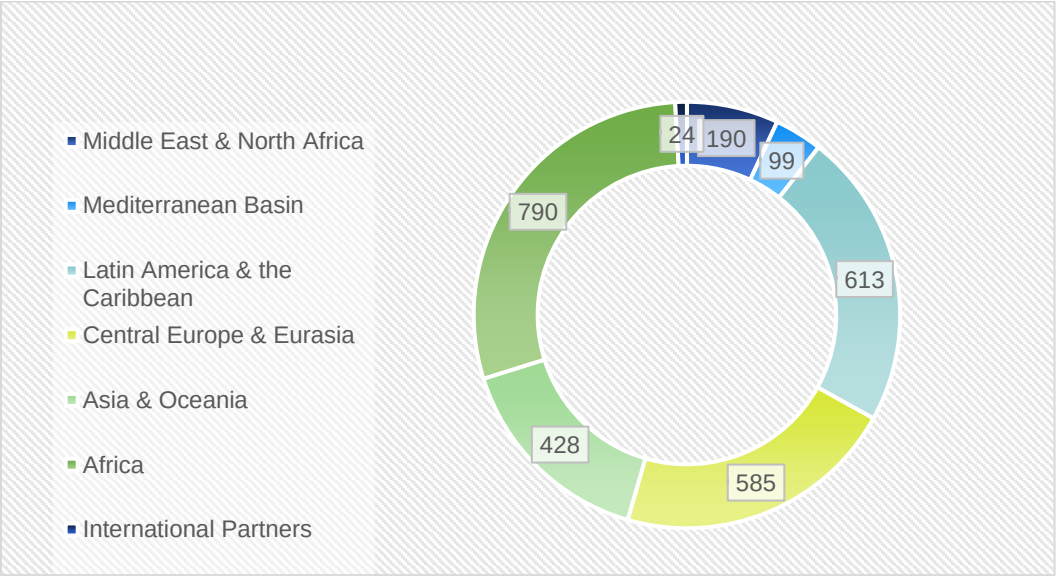
Agricultural courses attracted the greatest number of participants in courses held in Israel, followed by education:

Figure 42: Participants in MASHAV courses held in Israel in 2018-2019 by topic



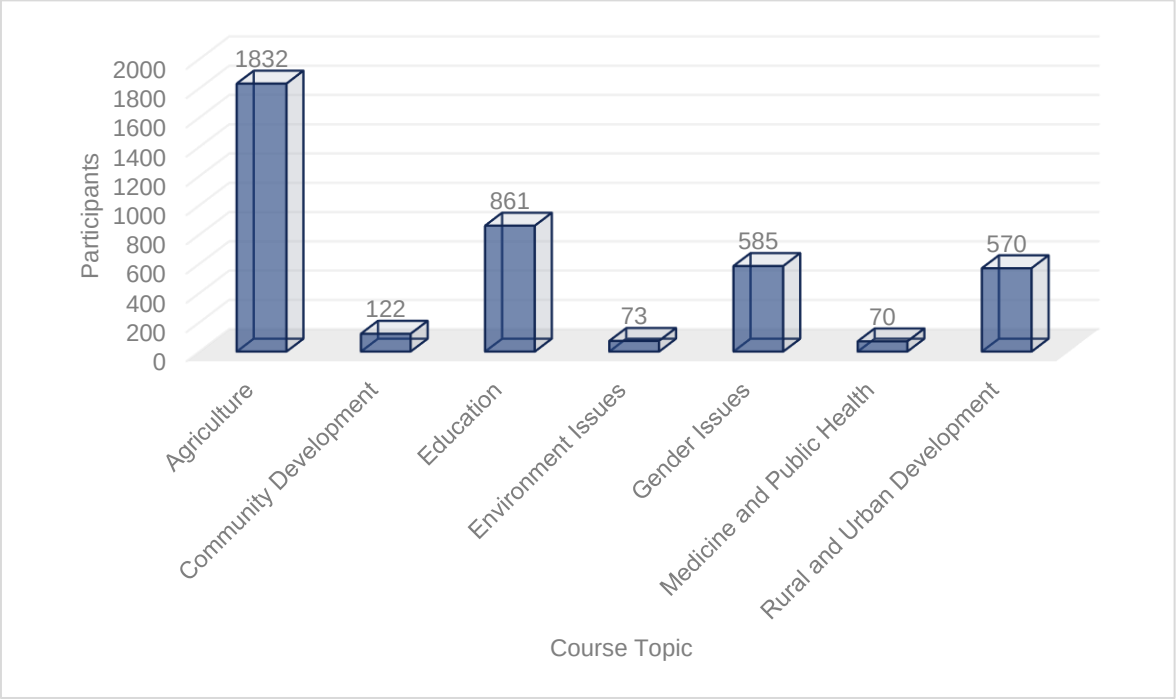
Over half of participants in projects held in Israel were from either Africa (790 participants) or Latin America & the Caribbean (613):

Figure 43: Participants in MASHAV courses held in Israel in 2018-2019 by region



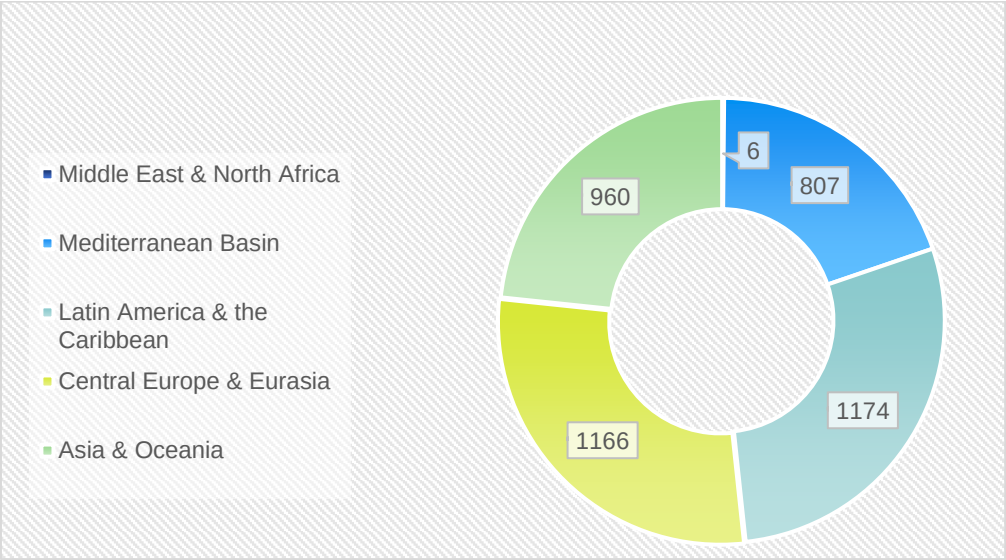
In 2018-2019, 4,113 professionals took part in 85 in-situ courses offered in a total of 40 host countries. As with courses taking place in Israel, agricultural courses attracted the greatest number of participants in courses abroad:

Figure 44: Participants in MASHAV abroad courses by topic (2018-2019)



Central Europe & Eurasia had the largest number of participants in courses abroad (1,174), followed by Asia and Oceania (1,166):

Figure 45: Participants in MASHAV abroad courses by region (2018-2019)



While MASHAV works broadly on international development, the KKL-JNF, a nonprofit, quasi-governmental organization focuses more specifically on environmental challenges in Israel and abroad. Water, forestry and environment, education, community development, tourism and recreation, research and development are the six areas of emphasis for the KKL-JNF. The KKL-JNF shares its knowledge and experience in these areas with countries worldwide through international aid projects, hosting delegations, presenting at conferences, and participating in membership organizations. KKL-JNF also provides knowledge transfer activities in Israel.

For more information about Israel's climate change related international projects, courses and contributions, please see the "Implementation of the Sustainable Development Goals" report, submitted by Israel to the UN in 2019.