The Worldwide War on Global Warming and Its Implications for Israel[1]

- In the 2015 Paris Agreement, Israel undertook to reduce its greenhouse gas emissions from 10.1 tonnes per capita in 2015 to 8.8 tonnes in 2025 and to 7.7 tonnes in 2030. Israel will be able to meet these targets by carrying out its plans to convert coal-fired power plants to gas-powered ones by 2024 and meeting its target of raising the share of renewables in power generation to 30 percent.
- Since the Paris Agreement was signed, the United States and Australia have withdrawn from the agreement's emissions targets. The European Union, in contrast, is acting to toughen the targets. Total global emissions have not been declining, but in 2019 they leveled off relative to the previous year.
- To raise the greenhouse-gas emission targets, as the EU and other countries are expected to do the next few years, meaningful action to reduce emission beyond existing plans will be necessary in Israel, too, e.g., switching to electric vehicles and expanding the use of renewable energy.
- Taxation of carbon emissions ("carbon tax") in Israel is an effective way of reducing emissions further. Complementary measures to make it easier for groups that will bear the burden of this tax will make the measure easier for the public to accept.
- In recent years, many countries' central banks have been dealing with the implications of global warming for financial stability. The macroprudential implications of changes in the profitability of firms that produce fossil fuels and those that rely on their use, inter alia, are being explored.

Global warming is becoming increasingly important in economic discussions and decision-making processes around the world.[2] Although the intensity of the phenomenon, its implications, and the extent to which it is caused by worldwide economic activity are still disputed, international economic institutions, foremost the UN, the IMF, and OECD, the EU, and the IEA, consider it a threat that demands

[1] Before writing this report, we consulted with Lihi Goldenberg, Shahar Dolev, Arye Wagner, Yuval Laster, Amir Foster, Eitan Parnass, Avital Eshet, and Nir Shaviv. Galit Paltsur was very helpful in explaining the economic aspects of climate change.

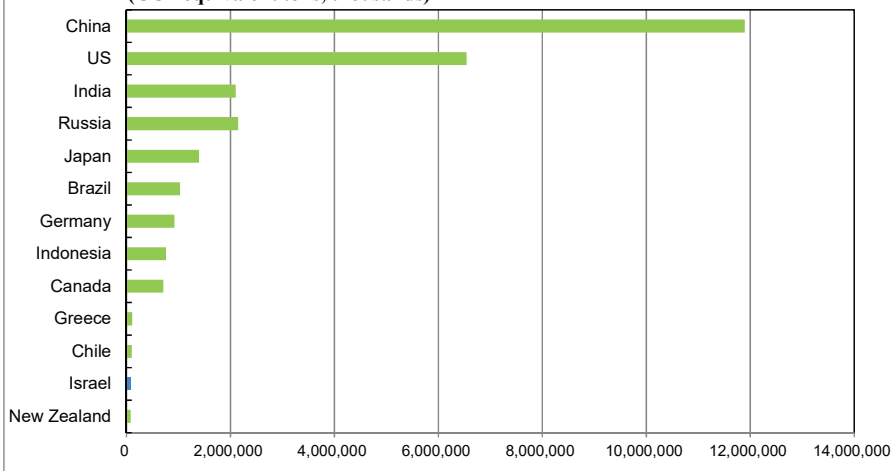
[2] This report deals neither with emissions of pollutants that do not affect global warming nor with non-energy areas of activity that do affect global warming, such as agriculture, because these have much less of an effect on warming than does energy.

a comprehensive policy response.[3] The report that follows deals with how Israel and the international community are coping with global warming and the potential implications of the war on global warming for Israel if the war gathers momentum.

Underpinning the global warming phenomenon is a market failure: Although the production and consumption processes that power it are having adverse effects of global magnitude, each individual polluter causes only a minute portion of the damage and therefore does not refrain from causing it. From an economic standpoint, coping with global warming entails, first of all, a change in the relative price of energy from sources that emit greenhouse gases and increased investments in the infrastructures of energy sources that emit less (or none) of this kind of pollution. Since market mechanisms have not brought about these changes thus far, and since there is no reason that they will occur by themselves, government intervention is needed and, as explained below, action within a multinational framework is also necessary.

Given its small size, Israel has little impact on global warming. According to OECD data, greenhouse gas emissions in Israel, like other small advanced economies, is about half a percent of the worldwide total (Figure 1). China alone, in contrast, is responsible for 30 percent of global greenhouse gas emissions. Nevertheless, Israel,

Figure 1
Greenhouse Gas Emissions
(CO2 equivalent tons, thousands)



SOURCE: Based on OECD.

[3] IPCC, 2014, Climate Change 2014: Synthesis Report, Intergovernmental Panel on Climate Change, Switzerland.

IPCC, 2018, Global Warming of 1.5'C, Climate Change Intergovernmental Panel on Climate Change, Switzerland.

USGCRP, 2017. Climate Science Special Report: Fourth National Climate Assessment, Volume I, U.S. Global Change Research Program, Washington, DC.

USGCRP, 2018, Impacts, Risks, and Adaptation in United States: Fourth National Climate Assessment. Volume II, U.S. Global Change Research Program, Washington DC.

IMF, Fiscal Monitor, How to Mitigate Climate Change, October 2019.

as a developed country that is integrated in the global economy, has not been able, and will not be able, to refrain from adopting the international standards that the developed countries have shouldered. The multinational process of cutting emissions has manifested thus far mainly in political persuasion; in the future, however, economic measures are also likely. It is possible that the first indication of imposing sanctions on countries (not EU members) that fail to meet EU standards for greenhouse gas emissions can be seen in a statement of intentions published by the EU Council in late 2019,[4] speaking of the future imposition of EU tariffs and trade restrictions against those that fail to adopt the EU's emission-prevention standards.

This report is divided into three sections. Section 1 gives the background for the discussion of global warming, primarily from the perspective of economic policy, with attention to (1) the global-warming phenomenon; (2) economic tools for coping with it; and (3) measures that various countries have already taken. In Section 2, Israel's integration into the international effort to tackle global warming—what has already been done and measures expected going forward—is described and analyzed. Section 3 concludes and offers several policy proposals and recommendations in Israel on the topic.

1. Background

a. Global warming—characteristics, economic measures, and economic implications

The past decade has seen growing scientific recognition of the existence of non-cyclical global warming—not the kind observed in previous eras but a steadily accelerating phenomenon with potentially existential implications for much of the world's population.[5]

Human activity is responsible for some of this warming, most of which stems from steeply rising concentrations of greenhouse gases—foremost carbon dioxide (CO2)—in the atmosphere (ibid.).[6] According to accepted forecasts, if the current trends in human activity continue, atmospheric CO2 will continue to grow and global warming will accelerate, with an increase of 1.5 degrees Celsius by the middle of the twenty-first century and around 3 degrees by its end. As temperatures rise, the damage to human activity and welfare will grow apace. These forecasts are premised on many

[4] https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf

[5] IPCC, 2014, Climate Change 2014 Synthesis Report, Intergovernmental Panel on Climate Change, Switzerland.

IPCC, 2018, Global Warming of 1.5'C Climate Change Intergovernmental Panel on Climate Change, Switzerland.

USGCRP, 2017. Climate Science Special Report: Fourth National Climate Assessment, Volume I, U.S. Global Change Research Program, Washington, DC.

USGCRP, 2018, Impacts, Risks, and Adaptation in United States: Fourth National Climate Assessment. Volume II, U.S. Global Change Research Program, Washington. DC.

[6] For a different view, see https://www.bundestag.de/resource/blob/580504/2b96f368c0a785e5e4a09bb1d9797449/19-16-143_fachgespraech_cop24_prof_nir_shaviv-data.pdf

working assumptions. For example, Glosove et al. (2014) find that small changes in discounting rates in long-term models manifest in very large changes in estimates of the cost of the damage.[7]

The extent of future impairment of economic activity due to global warming is unknown and will vary from country to country.[8] The expected negative impact is associated with the flooding of islands and coastal areas by rising ocean waters; changes in distribution of precipitation and natural disasters—floods, fires, and droughts; harm to ecological systems, flora and fauna, and in its wake, agriculture—humankind's sources of food; degradation of biodiversity, and more. All of these, of course, are likely to cause grave harm to human welfare.

It is hard to model these phenomena and produce convincing forecasts about them, since the uncertainty is reflected both in gradual forecasts and scenarios and in those of catastrophic implications. Preparing for these outcomes, in contrast, entails enormous expenses as a matter of certainty. Therefore, it is not easy to build a consensus around measures that should be taken, which, moreover, require multinational action despite wide variance in the vulnerability among countries and regions. Nevertheless, it is widely agreed that if current trends in global warming continue, major, if not catastrophic, economic damage will result. By extension, the need to take action on the matter is also widely acknowledged on the international scene. However, since the methods of action appear to entail impairment of economic activity in the present in order to head off negative impacts in the future, the response depends on the preferences of the public and its policymakers, their reliance on the forecast, and the relevant discounting rates.

The uncertainty in forecasting includes the possibility that the effects of warming will be slower and milder than the current estimates have it. It is also within the realm of possibility, however, that even more devastating geophysical scenarios will come to pass in the near future, e.g., due to permafrost melting. In the field of human behavior, the disaster scenarios relate, among other things, to mass waves of migration that will cause immense harm.

Coping with global warming is roughly divided in two[9]:

1) adaptation, i.e., preparing for the implications of global warming, e.g., evacuating localities in areas that face flooding[10];
2) mitigation of greenhouse gas emissions.

[7] M. Golosov, J. Hassler, P. Krusell, and A. Tsyvinski, 2014. "Optimal Taxes on Fossil Fuel in General Equilibrium," *Econometrica* 82, no. 1: 41–88.

[8] Certain countries may gain from global warming, e.g., if their permafrost becomes cultivable or if currently frozen maritime routes open up.

[9] The UN Framework Convention on Climate Change (UNFCCC) adds subdivisions such as capacity building and funding for climate and technology transfer. See https://unfccc.int/resource/bigpicture/

[10] The Israel Ministry of the Environment has prepared a methodological working paper on the topic: "Israel's Deployment for Adjustment to Climate Change," adopted by government resolution. See https://www.gov.il/he/departments/policies/dec4079_2018 (Hebrew). It seems, however, that the preparations, particularly in setting schedules and allocating requisite budgets, have not yet begun. On the expected effects of global warming on Israel—declining precipitation and higher heat loads—see Y. Yosef, et al. (2019).

Adaptation depends on each country's specific conditions and demands readiness at the country (or geographic-region) level. Action to stanch global warming, in contrast, is possible only via international cooperation because warming in each country is affected by emissions from all other countries.

In view of the aforementioned forecasts, a broad international effort is underway to determine ways of coping with global warming. The pinnacle of this effort, thus far, is the 2015 Paris Agreement on Climate, signed by 197 countries and aiming to hold total global warming to 0.3 degrees above the 2015 level. The accord demands a meaningful mitigation of emissions (of CO2 and additional greenhouse gases) by 2030 and a flatline of zero (net) emissions[11] in 2050 and thereafter. To attain these goals, it will be necessary to raise the relative prices of fossil fuels, make public investments in low greenhouse-gas-emission infrastructures, and carry out the relevant research and development.

The Paris Agreement attempts to bridge the clashing interests of various groups of countries, divided into two:

1) In developing countries, the standard of living and the extent of greenhouse-gas emissions (per capita) is lower than in industrialized countries, prompting them to demand equality before emission restrictions are imposed.
2) Countries that have stable or falling populations prefer to use total emission criteria and those with growing populations—including Israel—favor criteria of per-capita emission.

The Paris Agreement left it to each signatory country to draw up its own mitigation roadmap. The countries are expected meet the targets—even if they are not formally and legally required to do so—and even to toughen their standards every five years. For lack of a formal and statutory commitment, however, no mechanism for the enforcement of the various countries' mitigation roadmaps has been established. The only inspection mechanism agreed upon is public reporting on meeting the goals once every five years (starting in 2023). In addition, the countries must report every other year on their progress in carrying out their stated undertakings within the framework of the Agreement.

In the estimation of the International Monetary Fund (IMF, Fiscal Monitor, 2019)[12] and the International Energy Agency (World Energy Outlook, 2019), the various countries' commitments under the Paris Agreement will not suffice to meet the targets agreed upon. Furthermore, it is not clear how well the countries are acting in accordance with their commitments (ibid.).

Since the Paris Agreement was signed, the consensus hammered out under its aegis has begun to fray. In 2017, the United States announced its intention of withdrawing from the Agreement and, under the terms of the Agreement itself, it can do this in

[11] Net emissions are total emissions less absorption of greenhouse gases, e.g., by planting trees. Since the reckoning takes place on a country basis, one country can reduce total emissions by importing goods produced through high-emission methods instead of making them at home.

[12] IMF, Fiscal Monitor, How to Mitigate Climate Change, October 2019.

2020.[13] The European Commission, in contrast, adopted in late 2019 a policy paper centering on lowering greenhouse-gas emissions to zero by 2050 in the European Union states. Although the EU has a much lower level of emissions than the US and certainly China have, the paper also relates explicitly to the possibility of applying diplomatic pressure to the EU's trade partners for action in the same direction—a matter of special relevance for a small and open economy such as Israel, which does much of its trade with the EU. Furthermore, the paper states that, in order to preclude unfair competition with EU manufacturers, the EU may impose taxes on imports from countries that fail to accept its environmental norms. It is also stated in the document that the EU will not sign additional trade accords with countries that fail to meet the targets that they accepted in the Paris Agreement.[14]

b. Economic tools for dealing with global warming

The accepted macroeconomic approach toward testing the utility of fighting global warming compares the costs of mitigating warming in the present (in terms of lost output and welfare) with the costs of lost output and welfare in the future on account of the warming (Nordhaus, 2014).[15] The Paris Agreement is based on this approach.

An important instrument in this context is a set of policy tools for internalizing the environmental costs of CO2 use, so that the mitigation decided upon can be carried out in an economically efficient way. The two principal ways of mitigating emissions efficiently are taxation of CO2 emissions and cap-and-trade schemes, i.e., the ability to buy and sell authorizations to emit limited quantities of CO2, thus making it possible to control emission quantity and create a market of permits. Both methods have shown empirical success in mitigating CO2 emissions (Krogstrup and Oman, p. 20).[16] A recent analysis shows that the carbon-tax mode of action is preferable (IMF, p. 7)[17] because, among other things, it is less complex and complicated to operate than the alternative. Emission taxation, however, does not lend itself to ab initio determination of its desired extent, and frequent changes in the tax rate are politically difficult to implement. Furthermore, a correct design of emission taxes, one that brings them into accordance with the structure of the external costs, is no trifling matter. (For a discussion of the carbon tax, see below.)

Many central banks that include financial stability in their purviews have a direct stake in global warming[18] due to the growing realization that assuring financial stability

[13] Australia's commitment to fight global warming has also waned since the Paris Agreement was signed.

[14] https://ec.europa.eu/info/sites/info/files/european-green-deal-communication_en.pdf.

[15] W.D. Nordhaus, 2014. A Question of Balance: Weighing the Options on Global Warming Policies, Yale University Press, New Haven and London. A certain weakness of this approach is that it is based on scenarios involving very high uncertainty.

[16] S. Krogstrup and W. Oman, September 2019, Macroeconomic and Financial Policies for Climate Change Mitigation: A Review of the Literature, IMF, WP/19/185.

[17] IMF, Fiscal Monitor, How to Mitigate Climate Change, October 2019.

[18] The Bank of Israel is an exception in this respect because its duties include serving as the government's economic adviser.

entails appropriate reference to the risks of global warming due to their immensity and materiality.[19] The systemic financial risks associated with global warming include, among others, risk to investment credit, to assets exposed to warming damage, and to the entities that insure these assets. Firms whose production processes involve high levels of greenhouse-gas emission face business risks because they are susceptible to policy measures taken in the effort to mitigate the emissions (Ploeg and Rezai, 2019[20]; NGFS, 2019[21]). Indeed, for several years now, central banks around the world have been dealing with the global-warming issue and its possible macroprudential effects. The activities of some fifty central banks and financial regulators in this field, including those of large European countries (but not the United States), are coordinated by a voluntary international body, the NGFS.[22] In the years to come, the share of central banks in tackling global warming may branch into additional areas (BIS, The Green Swan, 2020).[23]

c. Measures taken by various countries in view of the Paris Agreement

At the core of the Paris Agreement are the participating countries' NDC (Nationally Determined Contribution) programs, i.e., undertakings to cut back on their greenhouse-gas emissions by 2025/2030.

The large majority of signatories to the Agreement have already drawn up such schemes. However, it appears that the cumulative result is actually an increase of 10 percent in emissions in 2030. Thus, the terms of the Agreement are such that the countries should be establishing stricter NDCs once every five years, with 2020 as the first milestone on this roadmap of presenting plans with increasingly strict measures[24]:

— 184 of the 197 signatory states have presented NDC programs and quite a few are preparing to unveil more stringent programs of this kind in 2020.

— Many advanced economies are promoting action plans that envision the total cessation of greenhouse-gas emissions by 2050. Around a dozen of them (including the UK, Germany, Japan, Canada, and France) have already designed programs of this type and many others have expressed the intention of doing the same.

— A large majority of countries has made systematic progress in establishing statutory, administrative, and technical mechanisms that would allow them to implement their NDC programs.

— Given that funding difficulties are likely to burden developing countries in implementing these schemes, developed countries have undertaken to help to

[19] See https://www.bankofengland.co.uk/climate-change)

[20] NGFS (Network of Central Banks and Supervisors for Greening the Financial System). 2019, A Call for Action: Climate Change as a Source of Financial Risk. Paris: NGFS Secretariat.

[21] A. Rezai and F. van der Ploeg, 2019. Stranded Assets in the Transition to a Carbon-Free Economy.

[22] https://www.ngfs.net/en/page-sommaire/governance .Israel is not a member of this body.

[23] BIS, 2020. The Green Swan, Central Banking and Financial Stability in the Age of Climate Change. Proposals have also been put forward for direct involvement of central banks in providing investment credit or guarantees for the prevention of emissions. Practically speaking, such measures amount to fiscal intervention by the central bank and are more relevant in developing countries.

[24] See UNFCCC, UNDP, 2019. The Heat is On, Taking Stock of Global Climate Ambition.

fund them. At the present writing, however, there are no specific agreements and mechanisms for this.

As for actual developments, the picture is mixed. In 2018, emissions of carbon dioxide (the main greenhouse gas) increased by 1.7 percent and the share of CO2 in the atmosphere set a record—overshadowing the agreements already made and clarifying the need for more aggressive policy measures. This increase, however, did not recur in 2019; CO2 emissions remained at the 2018 level.[25]

2. Israel's integration into the worldwide war on global warming[26]

Emissions—the situation today

Israel's greenhouse-gas emissions in 2017—the latest year for which data are available—came to 80 million tonnes, up 0.4 percent from 2016, a small year-on-year increase relative to the 1 percent average in the past decade. Most of Israel's greenhouse-gas emissions, like those elsewhere, are of carbon dioxide. (The other main greenhouse gases are methane and hydrofluorocarbons).

To express the effect of greenhouse gases in schematic terms, it is customary to express it in terms of CO2 on the basis of an index that reflects the global warming potential of each gas.[27] The share of carbon dioxide in Israel's total emissions fell from 86 percent in 2010 to 82 percent in 2017.

Most emissions around the world, and in Israel, are byproducts of energy production. The rest comes from industrial processes, agricultural activity, and solid waste (Table 1). Energy production includes the energy industries (producers of electricity and gas and fuel industries), energy used to power motor vehicles (transport), energy production in manufacturing and construction, and households.[28] In 2016, the most recent year for which inter-country data are available, electricity production accounted for about half of greenhouse-gas emissions in Israel, far above the 30 percent average weight among OECD member states. The difference traces, among other things, to a 20 percent difference between Israel and the OECD countries in the intensity of carbon in energy production, because the processes used to produce energy in these countries are more efficient on average, in terms of the climate, than in Israel. This is the outcome of differences in the sources of energy: In some OECD countries, nearly all energy is produced by means of nuclear power or renewables. The share of greenhouse-gas emissions by households in Israel is below the OECD average, probably because Israeli households consume little natural gas and other fuels for

[25] ttps://www.iea.org/news/defying-expectations-of-a-rise-global-carbon-dioxide-emissions-flatlined-in-2019.

[26] The source for the Israel data in this part of the report is the site of the Central Bureau of Statistics; that for the other countries is the OECD statistics site, unless otherwise stated.

[27] The index relates to the amount of heat trapped by a unit of atmospheric gas in a given period of time. It is expressed in CO_2 terms because this gas is believed to be the main culprit in trapping heat in the atmosphere. It is customarily presented for periods of 20, 100, and 500 years.

[28] Households produce energy mainly by using compressed gas for cooking and kerosene for heating.

home heating (evidently making more extensive use of electricity). Another difference between Israel and the OECD countries is the large share of waste in greenhouse-gas emissions in Israel; the environmental damage occasioned by solid waste in Israel is especially acute (see Box 1).

Table 1
Greenhouse gas emissions, by sector
(Percent of total emissions, 2016)

	OECD	Israel
Energy	81	80
Energy industries	30	50
Manufacturing and construction industries	13	6
Transportation	23	23
Households; for residences	11	1
Other	1	0
Manufacturing processes and use of products	7	9
Agriculture	9	3
Waste	3	8

SOURCE: Based on OECD.

Table 2 itemizes the mix of energy sources in Israel in 2018, the mix in 2014, and the coefficient of carbon intensity in producing energy from each source.[29] The table shows, for example, that coal produces 1.8 times more CO2 emissions for energy production than does natural gas. Also visible is the change in the sources of energy used to produce electricity in Israel in recent years. In 2014, almost half of Israel's energy was produced by burning coal (49 percent); by 2018, the share of coal fell to 30 percent whereas that of natural gas climbed to 66 percent. This transition to a less polluting source of energy helped to reduce Israel's greenhouse-gas emissions considerably, and if several foreseen measures (detailed out below) come to pass, the trend and its contribution may gather strength by 2030.

Table 2
Emission coefficient and fuel mix in electricity generation
(Percent of total production, in tons of crude oil equivalent)

	2014	2018	*2030	Coefficient (ton of coal emission per ton of crude oil equivalent)
Coal	49	30	0.7	3.7
Natural gas	48	66	69	2.1
Heating oil	0	0.08	0	2.9
Diesel	0.008	0.3	0	2.9
Solar energy	0.15	2	30	0.0

*Scenario in line with the Ministry of Energy's decision regarding shifting coal-burning plants and generating 30 percent of electricity via renewable resources.

SOURCE: Based on Central Bureau of Statistics and US Energy Information Administration.

[29] This coefficient is defined as the quantity of greenhouse gases emitted per unit of energy produced from the same source; it may be interpreted as the cost of producing a unit of energy in terms of CO_2 emission.

The second most significant gas in global warming is methane, the share of which in pollution in Israel has risen slightly in recent years and came to 9 percent in 2017. The hundred-year Global Warming Potential (GWP) index for methane is 28. Namely, over a period of 100 years, a unit of methane traps twenty-eight times as much heat in the atmosphere as does one of carbon dioxide. The main precipitants of methane emissions are solid waste and its deconstruction, and agricultural activity.[30] In recent years, the share of CO2 in total greenhouse-gas emissions has been falling as against an increase in the share of hydrofluorocarbons (HFC), the third most important gas. HFC gases, emitted mainly as a consequence of industrial refrigeration processes, accounted for 7 percent of total emissions in 2017. The GWP index for hydrofluorocarbons is estimated at 1300–1500.[31]

It is customary to deconstruct changes in an economy's total greenhouse-gas emissions on the basis of the Kaya identity,[32] which separates sources of emissions into factors of emission intensity (the environmental footprint of energy production), intensity of energy production in GDP, per-capita GDP, and population increase, as follows:

$$\text{Emissions} = \frac{\text{Emissions}}{\text{Energy}} * \frac{\text{Energy}}{\text{GDP}} * \frac{\text{GDP}}{\text{Population}} * \text{Population}$$

Figure 2, breaking down the components of the Kaya identity for the Israeli economy and the OECD average, shows that the decline in pollution in Israel in recent years traced mainly to a decrease in the intensity of energy in GDP, which remains high by the standards of developed countries. This intensity is declining in advanced economies due to greater production efficiency in each industry and, to a lesser extent, a restructuring of the economy that manifests in switching to less energy-intensive industries. The downturn was abetted by a decrease in carbon intensity in energy production due to switching from coal to natural gas. In 2006–10, in contrast, the main contributing factor to the decrease in emissions was the change in intensity of carbon in energy production. In those years, Israel made growing use of natural gas for electricity production due to the activation of the Yam Tethis reservoir and the import of gas from Egypt. However, growth of population, per-capita GDP, and energy intensity in GDP at that time abetted an upturn in emissions and offset the decrease occasioned by the other developments, allowing total emissions to increase by 1 percent per year. In the OECD countries, in contrast, energy intensity in GDP

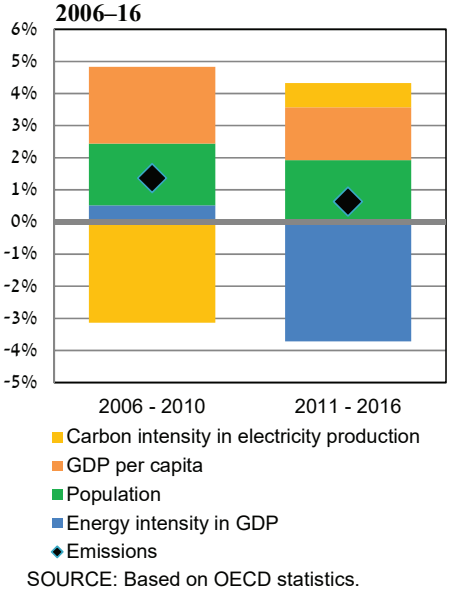
[30] Methane is the main component of natural gas; its combustion produces carbon dioxide.

[31] In 2016, HFCs were added to the Montreal Protocol, signed by member countries in 1987 pursuant to the Vienna Convention for the Protection of the Ozone Layer (1985). The protocol specifies substances harmful to the ozone layer in order to mitigate their use. HFCs are volatile synthetic substances developed in the United States pursuant to the ban on the use of substances listed in the Montreal Protocol. Over the years, notwithstanding their contribution to attenuating damage the ozone layer, HFCs have been found to abet the trapping of heat in the atmosphere.

[32] Kaya, Y., and Okoboji, K., 1997. Environment, Energy, and Economy: Strategies for Sustainability. Tokyo: United Nations University Press.

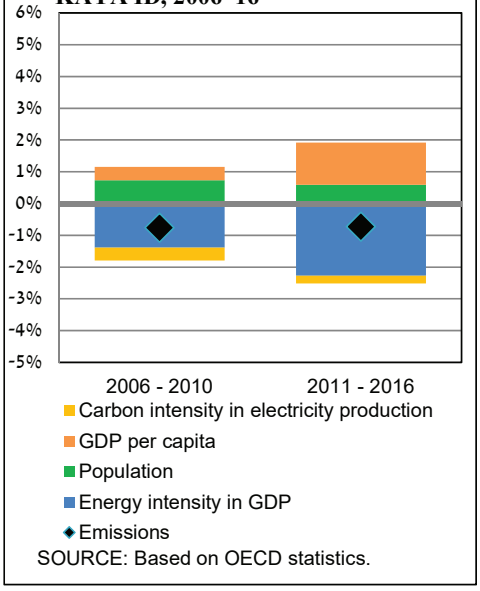
continued to fall throughout that period and was the main factor in allowing CO2 emissions to decline.

Figure 2a
The Change in CO2 Emissions in Israel, by Factors - KAYA ID 2006–16



SOURCE: Based on OECD statistics.

Figure 2b
The Change in CO2 Emissions in OECD Countries, by Factors - KAYA ID, 2006–16



SOURCE: Based on OECD statistics.

3. Potential effects of international global-warming mitigation processes on Israel

The objective of the Paris Agreement, as stated, is to hold global warming to 0.2 degrees above the 2015 level. In accordance with the rules of the agreement, Israel Government Resolution 542 (2015) sketched a road map of policy objectives in terms of tonnes of emission per capita; this document was presented to the UN climate convention secretariat ahead of the signing of the climate-convention accord at the end of that year.[33] The resolution sets forth a detailed trajectory of mitigation: from 10.1 tonnes per capita emission in 2015 to 8.88 in 2025 and 7.7 by 2030.

Along with Israel's participation in the global effort, the Israeli commitment to the world climate targets also derives from the risk of deviating from the global norm and, foremost, concern about swerving from the ambitious downward emissions trajectory that the European Union countries have been promoting. For this reason, it will be important for Israel to consider a policy scenario that would lead to zero emissions in the long-term—by 2050, for example—in accordance with the EU targets.

[33] See Government Resolution 542, September 20, 2015:

Policy trends around the world are shrouded in uncertainty because impediments to the emission-mitigation policy, foremost the United States' declaration of withdrawal from the climate agreement in 2020, are also at work.[34] China and India are also continuing to promote and develop coal-fired power plants and some European Union countries, such as Poland, Greece, the Czech Republic, Romania, Bulgaria, and Croatia, are continuing to produce electricity by means of coal and, at the present writing, have no implementable plan to switch to alternative energy sources. Conversely, forces emanating from multinational organizations and developments in the European Union may create pressure to speed up the attainment of the emission-mitigation targets. It is not just a theoretical matter to understand the implications of these international processes for Israel, because adopting the target of zero emissions by, say, 2050, will have immediate repercussions for Israel. This is because the Israeli economy's current investments in gas and electricity-production infrastructures and the country's building regulations have implications to a term of twenty years ahead, and the emission targets will impact both.

The Minister of Energy recently decided to convert Israel's coal-fired power plants to gas by 2025 and raised the target for use of renewable energy sources to 30 percent of total electricity produced.[35,36] These measures will allow Israel to meet its commitments under the Paris Agreement. Figure 3 shows per-capita emissions in Israel from 2006 to 2017, the targets that were set within the framework of the roadmap, and the national per-capita CO2 emission forecasts in view of the policy measures taken, i.e., converting coal-fired power plants to gas and raising the share of renewables in electricity production to 30 percent.[37] To facilitate comparison, the figure also shows average per-capita emission levels in OECD countries in the past. The per-capita level in Israel declined from 10.5 tonnes in 2010 to 9.7 in 2017[38] and was below the OECD average throughout the period, with the exception of an episode in 2012 in which the supply of gas from Egypt was interrupted, forcing Israel to turn to polluting energy sources.

To develop the estimate, we assumed that total per-capita emissions from activities other than electricity production (e.g., transport and industry) will remain constant. This assumption, in our judgment, sets an upper bound for the quantity of emissions that trace to this source. The changes in total emissions from factors other than

[34] Twenty-two US states, however, including most of the large ones, are continuing to pursue the emission-mitigation roadmap despite the Federal Government's policy. For details, see http://www.usclimatealliance.org/.

[35] https://www.gov.il/he/departments/news/ng_131119

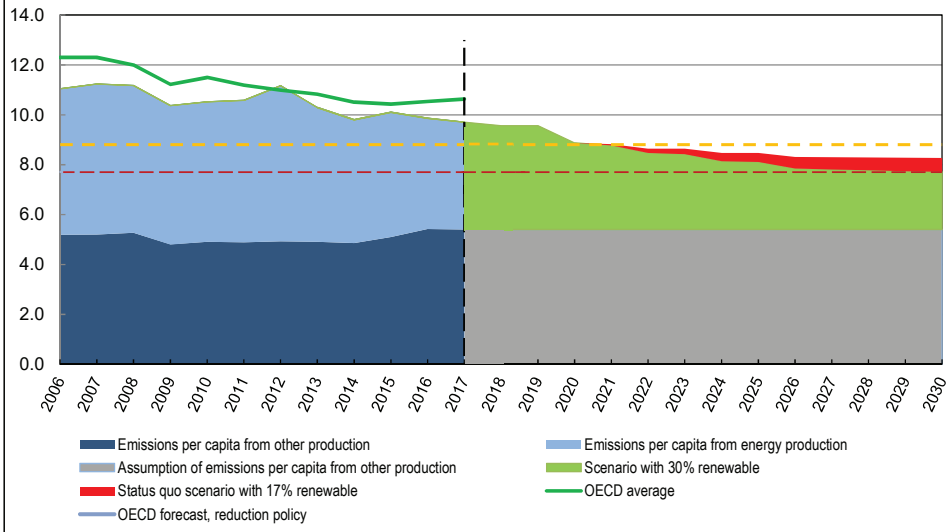
[36] https://www.gov.il/he/Departments/publications/Call_for_bids/shim_2030yaad

[37] The rate of increase in electricity consumption in this scenario is derived from estimates of the Israel Electricity Authority, which are consistent with those of the Bank of Israel (Gallo, 2017). The coefficients of emissions per unit of energy produced were calculated in accordance with those of the Authority. See consultation ahead of setting policy of mitigation up to full discontinuation of use of coal, Electricity Authority, https://pua.gov.il/Publications/PressReleases/Pages/coil_policy.aspx

[38] See *Mitigation of Greenhouse-Gas Emissions at Israel—Followup Report on Implementation of the National Program and Targets for Mitigation of Greenhouse-Gas Emissions,* November 2018.

electricity production were slower than population growth in the past decade and, turning to the transport industry, the share of electric vehicles may grow and some manufacturing will switch from heavy fuel oil, kerosene, and diesel fuel to natural gas. These factors are supportive of the possibility of a decline in per-capita emissions not originating in electricity production.[39] This estimation is supported by research showing that the electrification of transport would probably do much to help mitigate emissions.[40]

Figure 3
CO2 Emissions per Capita: 2006–17 Data for Israel and OECD Countries, Policy Scenarios through 2030



SOURCE: Based on OECD Statistics and IEC.

Figure 3 indicates that even without converting power plants and increasing the use of renewables in production, per-capita greenhouse-gas emissions are likely to attain the target of 8.8 tonnes per capita by 2021, three years before the target date. It may also be seen that *ceteris paribus* converting Israel's coal-fired power plants to natural gas by 2025 will not suffice to meet the 2030 target, but increasing the share of renewables in electricity production to 30 percent, in accordance with the roadmap set forth in the Electricity Authority's scenarios, will make this possible. Experience, however, shows that the path to this achievement will not be an easy one. Since

[39] See Table 2 in this Report, which presents the emission coefficients of the various fuels.
[40] See Nathan Sussman et al., *Israel 2050—A Thriving Economy in a Sustaining Environment: Effects on Macroeconomic Growth in Israel,* Israel Democracy Institute (Hebrew).

the government's previous targets in this regard were not attained,[41] Government Resolution 542 set a target of 10 percent for 2020 and 17 percent by 2030. In 2020, the Israeli economy will probably meet the government's original target for the first time. This will happen due to the elimination of entry barriers to renewable electricity production, better management of tenders for renewable energy production, and more efficient bureaucratic procedures. In addition, the Encouragement of Investments in Renewable Energy Law allows a tax writeoff on the proceeds of home production of electricity using renewable sources.[42] The downing of the entry barrier to this kind of production will probably have a major effect on the energy sector because rooftops are believed capable of generating 7–32 percent of electricity countrywide.[43]

Meeting the renewable energy targets, together with the external utilities of developing this sector, make this a preferred policy instrument because it is well defined, measurable, and practicable.[44] In the estimation of the Ministry of Energy, however, weak exposure to light in the winter and in many daytime hours, along with the expected costs of renewable energy storage, rule out reliance on photovoltaic energy at more than one-third of electricity capacity for the time being.[45] Furthermore, it would be highly wasteful to operate fossil-fuel power plants as backups for the seasons and times of day when renewable energy is not available due to the capital unemployment that this would cause. Therefore, it is not being considered, at least until the imputed costs of pollution go up and are reflected in an increase in taxation. It is also important to remember that the planned increase in the share of renewable energy poses major challenges, such as closing the gap in energy infrastructure investment.[46]

4. The road ahead—a carbon tax?

Even though the Israeli economy is expected to meet the government's carbon emissions targets as expressed in Resolution 542, the dynamics of international processes may lead to the toughening of emission targets abroad in the next few years, necessitating further action to reduce per-capita emissions in Israel and make further

[41] After the fact, given the major decrease in prices of production by means of renewable energy sources, the economy saved 10 percent on its expenditure for electricity by not attaining the goals but fell behind the government's environmental targets for this reason. See Bank of Israel, Research Department, September 2017. "The Development of the Electricity Market in Israel: Toward a Sustainable Electricity Market," policy analyses and research issues.

[42] Encouragement of Investments in Renewable Energy (Tax Benefits for Electricity Production from Renewable Energy) Law, 5777-2016.

[43] R. Vardimon, 2011. "Assessment of the Potential for Distributed Photovoltaic Electricity Production in Israel," Renewable Energy, 36/2, pp. 591–594.

[44] See consultation ahead of setting policy of mitigation up to full discontinuation of use of coal, Electricity Authority, https://pua.gov.il/Publications/PressReleases/Pages/coil_policy.aspx

[45] See "Testing the Assimilation of a High Percent of Renewable Sources in the Israel Electricity Grid," Israel Energy Forum, The Heschel Center for Sustainability (in Hebrew).

[46] See Bank of Israel, Research Department, 2015. "Use of Renewable Energy in Israel," *Recent Economic Developments 140*, April–September.

progress after 2030. Resolution 542 includes several policy tools that are meant to suppress electricity consumption by 17 percent and reduce private travel by 20 percent relative to a "business as usual" scenario. Another policy instrument that is attracting growing attention around the world is a carbon tax.

Resolution 542 instructed the ministers of Infrastructure, Environmental Protection, Finance, and the Economy to present the Government with a detailed plan for attaining the climate targets. In April 2016, on the basis of the ministers' recommendations, the Government adopted (in Resolution 1403) a national program for the attainment of the greenhouse-gas emission mitigation targets in various specific ways[47] including NIS 500 million in state loan guarantees for investment in energy efficiency and mitigation of greenhouse-gas emissions, NIS 300 million in grants for investments in energy efficiency, accelerated depreciation for energy-saving products, green building standards, and a tax exemption for home producers of energy. It was also determined that a steering committee headed by a representative of the Ministry of Environmental Protection would be appointed to implement the national plan.[48]

One of the weaknesses of the energy-efficiency targets is that they are poorly defined, not measurable, and hard to estimate in terms of efficiency. For example, the efficiency targets are defined relative to a "business as usual" scenario, but the scenario on which they were built assumes a 3.2 percent annual average growth rate of energy consumption,[49] similar to the average rate in the decade preceding the resolution and in the forecast attached to the national plan for implementation of the Paris Agreement. In a subsequent forecast, however,[50] the growth rate of electricity consumption (corresponding to the GDP growth forecast in Tsur and Argov, 2018), was found to be only 2.7 percent, reflecting slower overall economic growth irrespective of greater efficiency in energy use. Furthermore, according to a more recent study, even this growth rate is biased upward because global efficiency processes and spillover of knowledge about production efficiencies are causing electricity consumption intensity in the OECD countries to decline.[51] Similarly, there is no reliable forecast of travel demand; therefore, it is problematic to set a target of mitigating travel as against the benchmark scenario.

Another weakness of the energy-efficiency targets is that estimating the effectiveness of subsidies for this, for investment purposes, is based on a geometric calculation of unit electricity consumption with and without a subsidy. This efficiency index rests

[47] See https://www.gov.il/he/Departments/policies/2016_des1403.

[48] Since it was established, the committee has published two follow-up reports. See https://www.gov.il/en/departments/publications/reports/reports_reducing_ghg_emissions_in_israel

[49] See Ministry of the Environment, National Plan for Implementation of the Paris Agreement, September 2016: https://www.gov.il/blobFolder/policy/natl_plan_for_ghg_reduction_and_energy_efficiency_april_2016/he/climate_change_and_energy_efficiency_natl_plan_to_implement_paris_agreement_sept_2016.pdf

[50] L. Gallo, 2018. *Long-Term Forecast of Electricity Demand in Israel.*

[51] L. Gallo, 2019. "Electricity Intensity in the Developed Countries: Global Divergence, Club Convergence and the Role of the Structure of the Economy," https://fsr.eui.eu/wp-content/uploads/2020/03/Gallo-FSR-CLIMATE-2019-Electricity-intensity-convergence.pdf

heavily on the assumption that new capital investment would not be made without the subsidy. If a capital investment that is more effective in terms of energy would be made even without the subsidy, it amounts effectively to nothing but a government expenditure that subsidizes capital investment. The saving on emissions due to such investments is, ipso facto, already built into the "business as usual" scenario. This aside, the subsidy is liable to create an incentive contrary to its purpose by supporting firms that manufacture at high electricity intensity that might otherwise have left the market. Thus, it may provide artificial support to energy-intensive firms and industries.

The weaknesses of these policy tools undermine the ability of energy-efficiency targets to mitigate greenhouse-gas emissions. It is true that the targets and the message they send the public have value in terms of consciousness-raising. However, the budget cost of these policy tools and the difficulty in monitoring their effectiveness subvert their credibility. For this reason, the carbon tax is increasingly discussed around the world as a policy tool that may deliver a more effective system-level response to the need to mitigate pollution.[52] A carbon tax is imposed on economic activity that causes greenhouse gases to be emitted into the atmosphere. Given the difficulty in taxing different activities differentially and in quantifying emissions in each activity, it is the tendency at this stage to apply the carbon tax to the core economic activity that causes pollution: energy production.[53] The development of scientific and economic tools in coming years, however, may make it possible to apply carbon taxes to a broader range of activities that cause considerable levels of emission.

The main advantage of the carbon tax is that it goes to the heart of the problem. This policy device directly addresses the main market failure, which originates in the absence of property rights to air. For this reason, one cannot price pollution without government intervention; therefore, the price mechanism creates a distorted equilibrium. The carbon tax makes national resource allocation more efficient by being imposed on the polluting product, forcing producers and consumers to build its external effects into their prices, thus encouraging correct prioritization of energy use. Admittedly, it is hard to gauge the future effect of this tax on the level of emissions, but its rate can be adjusted commensurate with the gap between the outcomes of its use and the effect desired. For this reason, the carbon tax appears to be the most effective method to use among those that influence pollution directly. The IMF substantiates this view in a report that compares various intervention mechanisms.[54] According to the IMF's calculations, the global tax rate that is needed to meet the targets in the Paris Agreement is $75 per tonne of CO2 emitted. The effect of such a tax on electricity and fuel prices in developed countries varies widely from country to country[55]; this is

[52] See Nathan Sussman, et al., *Israel 2050—A Thriving Economy in a Sustaining Environment: Effects on Macroeconomic Growth in Israel,* Israel Democracy Institute (Hebrew).

[53] In an OECD survey, carbon taxes were examined at large, on fuel, and on electricity. The taxes in question were imposed in Denmark, Finland, Norway, and Sweden in the 1970s, and in Chile, Colombia, France, Ireland, Japan, Mexico, Portugal, northern Africa, and Switzerland in the past decade.

[54] IMF, October 2019. *Fiscal Monitor: How to Mitigate Climate Change*.

[55] Ibid. p. viii.

also expected to create variance in public sentiment toward such a tax. Palatnik and Shechter (2008)[56] found that, under the conditions of the Israeli economy, a carbon tax would probably be effective in mitigating emissions. It should, however, be imposed gradually in order to allow firms to adjust their production inputs to the new price ratios and for consumers to adjust their home appliances, e.g., by installing home climate-control systems.

Another advantage of the carbon tax is that its effect is estimated on the basis of an assessable parameter—price elasticity of demand, particularly in electricity production and motor-vehicle use, the two predominant sources of pollution. These elasticities have been estimated abroad at 0.2–0.6,[57] meaning that a 1 percent increase in electricity price is expected to reduce electricity demand by 0.2–0.6 percent. Gallo (2018)[58] estimated 0.3 elasticity in Israel.[59] Even though these studies assume as a working hypothesis that price elasticity of demand is constant, it is often found in the professional literature that elasticity is not such and that, sometimes, this may be manifested in the opposite effect.[60] Thus, in the case of air pollution, the risk is that a too-low tax will lead to the sense that the price of pollution is worth paying for the right to pollute—a phenomenon known in the literature as "a fine is a price." To avert such a situation and attain the goal, the tax has to be high enough. In the IMF report, several simulations tested the level of carbon tax that would lower emissions to a scale congruent with the Paris Agreement targets; they found that the tax per tonne of CO2 emitted should be $75 per tonne.

Another advantage of the carbon tax over other emission-mitigating measures is the ability to track the population groups on which it is imposed, its impact on them, and its effect on the rest of the economy. This is particularly advantageous because it helps to deal with two issues that may sway decision-makers against the carbon tax: its regressivity (Krogstrup and Oman, p. 20)[61] and its differential effect on different industries, possibly allowing affected industries to unite more easily for political resistance to the tax. Exact measurement of the implications of the carbon tax for income distribution is complicated because the cost of taxing different sources of energy is distributed across many goods. However, direct measurement of household

[56] Ruslana Rachel Palatnik and Mordechai Shechter, 2008, "Analysis of the Impact of Economic Incentives to Control Greenhouse Gas Emissions within the Framework of a General Equilibrium Model of the Israeli Economy," The Economic Quarterly, 55:4, pp. 545–573 (December).

[57] For a meta-analysis of the empirical outcomes of price elasticity for energy demand, see X. Labandeira, J.M. Labeaga, and X. López-Otero, 2017. "A Meta-Analysis of the Price Elasticity of Energy Demand," *Energy Policy,* 102, pp. 549–568.

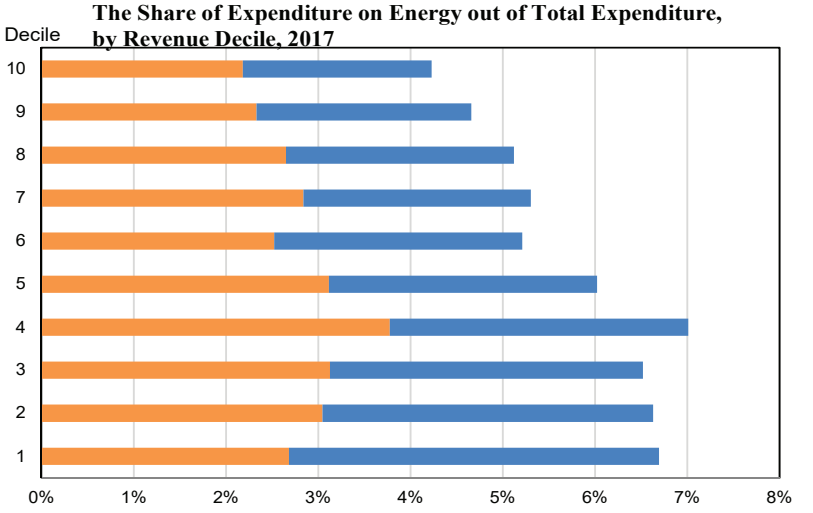
[58] The growth rate of electricity consumption in the scenario is derived from estimates of the Israel Electricity Authority, which are consistent with those of the Bank of Israel (Gallo, 2018).

[59] Although this study makes no explicit reference to the possibility of an effect of demand on price, this possibility does not stand to reason because electricity prices in Israel are set on the basis of estimates of production cost.

[60] See U. Gneezy and A. Rustichini, 2000. "A Fine Is a Price," *Journal of Legal Studies,* 29(1), pp.1–17, and discussion in the literature surrounding this article.

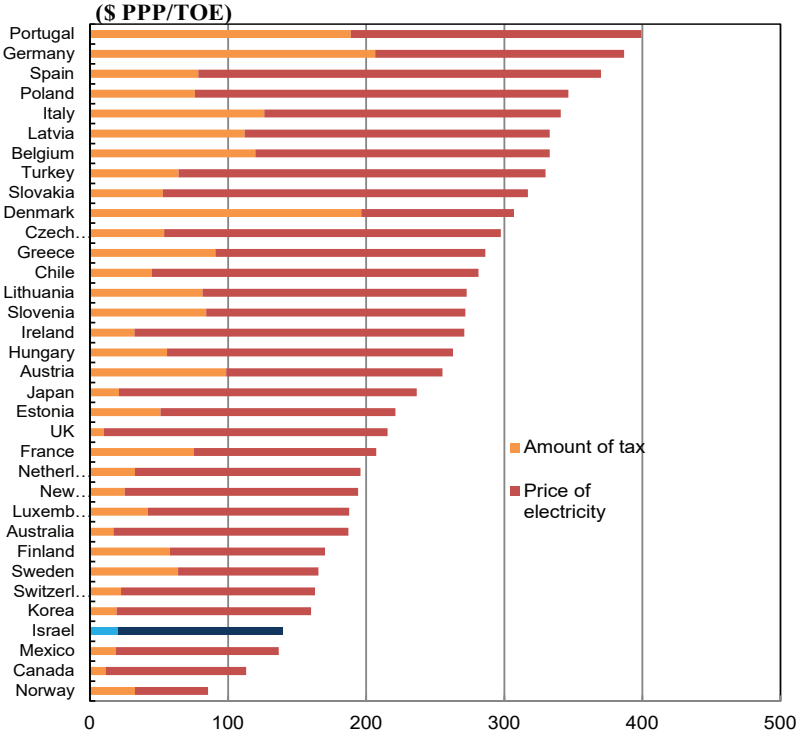
[61] S. Krogstrup and W. Oman, September 2019. Macroeconomic and Financial Policies for Climate Change Mitigation: A Review of the Literature, IMF, WP/19/185.

Figure 4
The Share of Expenditure on Energy out of Total Expenditure, by Revenue Decile, 2017



SOURCE: Based on Central Bureau of Statistics.

Figure 5
Electricity Price - Households, 2016
($ PPP/TOE)



SOURCE: Based on IEA.

expenditure on energy consumption only, in the form of electricity and motor-vehicle fuel, shows that this expenditure is higher in low-decile households (Figure 4). (Although this is not an absolutely precise metric, these are the data that are available to the public and that may influence public opinion.) Furthermore, since much energy expenditure is on motor-vehicle fuels and oils, the tax may inflict greater harm on inhabitants of peripheral areas—prompting, for example, the acute resistance to a similar tax in France that ultimately led to its repeal. It is important to give thought to these problems in planning a carbon tax before the decision to implement one is made. One possible solution is to use some of the receipts to compensate affected population groups (see Box 1).

The importance of a potential carbon tax in Israel also flows from the low price of electricity in Israel by OECD standards (Figure 5), originating in low cost of electricity in Israel and low taxation of this product. This enhances the use of electricity in Israel and abets the development of electricity-intensive industries and an electricity-intensive structure of consumption, resulting in higher greenhouse-gas emissions.

Box 1: A Carbon Tax in Israel—How Much Revenue Will It Generate?

In this box, we provide a rough estimate of the revenues that a $75 per tonne tax on carbon dioxide emissions—the rate that the International Monetary Fund has found necessary to lower global emissions to the Paris Agreement targets—may bring in. The calculation that follows rests on the assumption that the tax will apply only to the use of fuels for electricity production, transport, energy production in the business sector, and home heating, and relates only to carbon dioxide and not to emissions of other greenhouse gases. For example, the analysis does not address itself to taxation of greenhouse-gas emissions originating in agriculture—8 percent of total greenhouse-gas emissions in Israel—and by the chemical industry and industries that make extensive use of refrigeration gases. One of the future decisions relating to the application of a carbon tax will be whether to expand its incidence to these fields, broadening its coverage but at the price of making implementation more complex.

Table 1 presents the main points of the calculation. Line 1 shows the quantity of fuel combusted in Israel in 2017 for electricity production, transport, and households parsed by type of fuels; Line 2 presents the amount of CO2 emitted into the atmosphere by the combustion of one tonne of one of these fuels.[1] The product obtained by multiplying the quantity of fuels by the emission coefficients, i.e., total emission caused by each fuel, is shown on Line 3. Under these data appear the coefficients of emissions per unit of energy, fuel prices, the current rate of excise tax on the fuels, and the increase in fuel price occasioned by the imposition of the carbon tax. In this simulation, we lower the fuel excise because the carbon tax is meant to replace the excise in representing the external effects of their use. To the extent that the excise tax is intended to represent other external effects—such as the congestion effects in vehicle transportation—the carbon tax can be added to the existing excise tax.

[1] These data differ from the coefficients of pollution per unit of energy noted above. This is because one tonne of different fuels may yield different amounts of energy. For example, 1.93 times more energy may be produced from a tonne of natural gas than from a tonne of coal.

A carbon tax at the level examined here raises fuel prices in electricity production by 60—140 percent with the exception of diesel fuel, which is charged a much higher excise than the proposed carbon tax. Weighted by the current composition of fuel consumption, the total cost of the fuels for electricity production will increase, according to our calculation, by 87 percent, and given that fuel cost accounts for 63 percent of the electricity rate,[2] the tax will translate into a 55 percent rate increase. According to Gallo's estimate of the price elasticity of electricity consumption (Gallo, 2017)—approximately 0.3 on weighted average across all uses—such an upturn in price will manifest in a 16 percent contraction of demand for electricity insofar as the distribution of fuels does not change.[3] According to the calculation, after the downturn in excise receipts is offset—factoring in the decrease of electricity use, and assuming that there will not be a shift to use of energy that does not emit CO2—state revenues from the carbon tax are estimated at NIS 7.5 billion per year. They may be used to offer relief to households that will be harmed by the tax increase, e.g., lowering the rate of VAT by 1 percentage point across the board or reducing the lowest income-tax bracket by 1 percentage point—or by any other combination of tax relief, increase in public expenditure, or deficit reduction that the government may prefer. In a test that we ran, we found that the effect of imposing this tax concurrent with lowering VAT by 1 percentage point would be an increase of up to 0.3 percent in spending by the lowest income quintile as against a 0.1 percent decrease by the uppermost quintile. Insofar as the tax encourages more replacement of high-polluting fuels with less-polluting ones or with renewable energy, tax revenues will fall but the efficacy of the tax in reducing emissions—our goal—will grow. For example, terminating the use of coal and replacing it with natural gas would create in a revenue loss of more than NIS 1.5 billion per year but would reduce CO2 emissions in the manner shown in Figure 5.

A carbon tax on fuels used for transportation—before netting out its effect on travel—will increase government revenues by NIS 4.7 billion per year, which is essentially an addition of 15–20 percent to the current cost of gasoline (including the excise). Although the price elasticity of gasoline demand varies greatly among countries, there is a worldwide consensus that it is very low.[4] Therefore, and as there is no suitable transportation alternative, the effect of this tax increase on vehicle emissions is expected to be limited. In addition, already today a considerable excise tax is imposed on gasoline and diesel fuel, and to the extent that the excise already reflects the effects of travel on air pollution—and not other externalities such as congestion, funding road infrastructure, etc.—the question will arise of if, and to what extent, it will be correct to reduce it in lieu of the carbon tax.

An additional source of CO2 emissions is home cooking gas, which is also used for heating in some households. At current usage levels, a carbon tax on home cooking gas will only increase government revenues slightly. However, it is important that the taxation on it will be equal to that on electricity in order to prevent a shift of demand from heating with electricity to heating with home cooking gas as a result of taxes on fuel in generating the electricity.

[2] See description and analysis of structure of the electricity rate for 2019: Noam Botosh, The Knesset, Research and Information Center, Budget Supervision Department (in Hebrew).

[3] The change in distribution of fuels will be determined on the basis of the response of the electricity system management company (the "system manager") to fuel prices.

[4] Havranek, T., Irsova, Z. and Janda, K., 2012. Demand for Gasoline is More Price-Inelastic Than Commonly Thought. Energy Economics, 34(1), pp.201-207.

Carbon tax - Tax amount and revenues simulation

Fuel type		Coal	Natural gas	Heating oil	Diesel
Fuel used to produce electricity (2017)	(ton)	8,306,000	6,039,400	31,800	153,400
Emissions coefficients	(ton of CO2 per ton)	2.3	2.8	3.1	3.2
CO_2 Emissions	(ton)	19,186,860	16,759,335	97,880	487,352
per unit of energy	emission per ton of	3.7	2.1	2.9	2.9
Current price per ton (excl. excise tax)	(NIS)	360	1,002	1,314	1,600
Excise tax (current rate)	(NIS/ton)	46	17	15	2,945
"Carbon tax" per ton of fuel, at $75 per ton	(NIS per ton of fuel)	624	749	831	858
New price of fuel (includes carbon tax)	(NIS/ton)	984	1,751	2,145	2,458
Old price of fuel (includes excise tax)	(NIS/ton)	406	1,019	1,329	4,545
Addition to price	(NIS/ton)	578	732	816	(2,088)
New price per unit of energy (includes carbon tax)	(NIS/KwH)	0.37	0.25	0.72	1.30
Old price per unit of energy (includes excise tax)	(NIS/KwH)	0.15	0.14	0.44	2.41
Addition to price	(NIS/KwH)	0.22	0.10	0.27	(1.11)
Total government revenues - current consumption	(NIS million)	5,180	4,525	26	132
Net of excise revenues (that will be cancelled)	**(NIS million)**	**4,797**	**4,420**	**26**	**(320)**
Taking reduced demand into account	**(NIS million)**	**4,030**	**3,713**	**22**	**(269)**
Ratio of post-change price to current price		*2.42*	*1.72*	*1.61*	*0.54*

[a] Carbon Dioxide

[b] Exchange rate of NIS 3.6/$)

SOURCE: Based on Central Bureau of Statistics and Ministry of Energy.

5. Discussion, proposals, and recommendations

Thus far, Israel has not attained its self-set goals for power production from renewable resources. However, it is expected to meet the target in the current year and to attain the carbon dioxide emissions target for 2025 (8.8 tonnes per capita). If it succeeds in meeting its 2030 target for power production from renewable sources (30 percent), it will also, in all likelihood, attain the CO2 emissions target for that year (7.7 tonnes per capita) as well.

Notwithstanding the progress made thus far, it is important for the government to examine its ability to meet stricter targets in the coming decade and through 2050. As recognition of the dangers of global warming escalates, the international community will impose increasingly strict greenhouse-gas emission requirements and accompany them with tougher deadlines. If such developments actually occur, they will severely challenge Israel's decision-making system and the executive mechanisms that are tasked with implementing decisions in this matter, particularly in view of the intention of switching the economy to natural gas (which also contributes to global warming, albeit much less than does coal).

To date, Israel has not thoroughly examined ways of coping with greenhouse-gas emissions by means of a dedicated tax (e.g., carbon tax and/or cap-and-trade). Once such an examination begins, it should relate to the contribution of the fuel excise (a tax unique to Israel) to mitigating emissions, the possibility of imposing a carbon tax, the implications of taxing greenhouse gases for national income distribution, and the role of such taxation in the broader matrix of the government's budget sources.