

# AIR POLLUTION, GLOBAL WARMING & OZONE DEPLETION

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Israel today faces air pollution problems whose impacts range from damage to public health at the local level to global warming and stratospheric ozone depletion. This chapter begins with a brief survey of the international agreements addressing these concerns. A brief overview of Israel's greenhouse gas emissions follows, after which the focus turns to the atmospheric impacts of two key sectors: electricity production and transport. Finally, Israel's contribution to ozone depletion is examined.

Throughout the chapter, critical attention is given to the Government of Israel's *Report to the Department of Economic and Social Affairs of the United Nations* (June 2001). Claims made by the report, and issues avoided by it, provide the context for analyzing current trends in Israel's environmental performance.

## Israel's obligations under international agreements

Two major international conventions are of primary relevance to Israel's efforts to protect the atmosphere: the UN Framework Convention on Climate Change, addressing the problem of greenhouse gas emissions; and the Vienna Convention for the Protection of the Ozone Layer, geared toward phasing out the manufacture and use of ozone-depleting chemicals. Israel is a party to both regimes. Paradoxically, however, Israel is inconsistently regarded as a "developing" nation under the Climate Change Convention and a "developed" nation under the Vienna Convention.

Under the **Global Convention on Climate Change (1992)**, "developed" nations are defined simply and categorically as those belonging to the Organization for Economic Cooperation and Development (OECD). According to this definition, Israel is a developing nation despite the fact that, in terms of per capita gross domestic product, Israel is clearly in league with the

world's more economically prosperous societies. Nevertheless, as a "developing" nation under the Convention, Israel is not bound to achieve a specific reduction in greenhouse gas emissions. Rather, it is simply obligated to prepare a national inventory of greenhouse gas emissions and their removal by natural "sinks." While all parties to the Convention are obligated to take precautionary measures to anticipate, prevent or minimize the causes of climate change (art. 3), this duty is general and is therefore extremely difficult to enforce.

The Vienna Convention for the Protection of the Ozone Layer (1985) and the Montreal Protocol on Substances that Deplete the Ozone Layer (1987) provide a framework for controlling the manufacture and use of ozone-depleting substances. Specific targets for reducing and eventually eliminating the production and consumption of these substances have been established under this regime. A developed nation as defined by the Convention, Israel must phase out its production of ozone-depleting chemicals by 2005, with certain exceptions to be discussed below. This requirement has real significance to Israel, as the world's second-largest producer of methyl bromide, a "controlled substance" under the regime.

Beyond the two issue-specific regimes to which it is a party, Israel is a signatory to **Agenda 21**, which includes a broad array of measures aimed at protecting the atmosphere. In addition to addressing global warming and ozone depletion, Chapter 9 of Agenda 21 calls for measures to promote energy efficiency and renewable energy resources development. It also lists steps to combat transport-generated pollution, and to reduce emissions causing transboundary air pollution. Agenda 21, while declaratory in nature, provides a constructive framework for advancing necessary reforms in Israel's energy, transport and industrial sectors.

## Overall trends in greenhouse gas emissions

The Government of Israel's *Report to the Department of Economic and Social Affairs of the United Nations* (June 2001)—hereafter referred to as the "Government's Report"—includes a brief declaration that a national inventory of greenhouse gas emissions and the removal of those gases has been prepared. No specific data is provided, however, skirting the fact that Israel's greenhouse gas emissions have increased dramatically during the decade since the Climate Change Convention was adopted. Electricity production in Israel grew by an average of 7.5 percent per year from 1990 to 2000,<sup>1</sup> with coal, fuel oil, and diesel accounting for 100 percent of the

energy resources used by this sector.<sup>2</sup> The number of motor vehicles operating on Israel's roads during the same period rose from just over one million vehicles in 1990 to 1.73 million in 1999.<sup>3</sup> By the end of 2001, the number of vehicles is expected to reach 2 million—fully double the number of vehicles operating in 1990.

These and other developments have led to a major increase in Israel's greenhouse gas emissions over the past decade. Though not included in the Government's Report, other sources reveal that from 1990 to 1999, total CO<sub>2</sub> emissions nearly doubled – from 35 million tons to 62 million tons.<sup>4</sup> Per capita CO<sub>2</sub> emissions rose significantly during the same period – from 7.5 tons to 10 tons.<sup>5</sup> As of 1995, Israel was a larger per-capita CO<sub>2</sub> producer than Austria, France, Switzerland and Sweden.<sup>6</sup> Nitrogen oxide emissions, another contributor to global warming, registered even more dramatic growth – from 146,000 tons in 1990 to 310,000 tons in 1999.<sup>7</sup>

The increase in Israel's greenhouse gas emissions reflects, in part, the rapid growth of Israel's population over the past decade. From 1990 to 1999, the nation expanded by a staggering 34 percent, from 4.660 million to 6.125 million people.<sup>8</sup> Today Israel's population continues to grow by roughly 2.3 to 2.5 percent per year – a rate unmatched by other advanced industrial nations. Yet population trends alone do not explain the growth in greenhouse gas emissions. At the same time that Israel's population expanded, its economy soared, placing it firmly in the league of “developed” nations as measured by per capita Gross Domestic Product (GDP). It is ironic, in this regard, that Israel – a “developing” nation under the Climate Change Convention – has a per capita GDP exceeding that of several states that are considered “developed” nations under the Convention (Greece, Mexico, Poland, Portugal, and Spain, for example) simply by virtue of their OECD membership.<sup>9</sup>

By the year 2012, developed nations are bound by article 3 of the Kyoto Protocol (which Israel has signed but has yet to ratify) to cut greenhouse gas emission to 5 percent below 1990 levels. Given its sustained population growth, Israel is likely to be far from meeting this target, from which it is exempt, in any case, as a “developing” nation.” Nevertheless, a vigorous campaign to stabilize, if not reduce, Israel's greenhouse gas emissions is urgently needed. The fact that electricity production continues to grow at three times Israel's current rate of population growth suggests that there is ample untapped potential for curbing greenhouse gas emissions through energy conservation measures.

While the Government's Report declares that Israel will undertake "voluntary activities" toward reducing its greenhouse gas emissions, no specific reduction or stabilization targets have been set. Moreover, the Government to date has exercised no practical leadership in identifying or promoting practical measures to slow the nation's ever-growing output of greenhouse gases. In the absence of a systematic plan incorporating measures to be taken by private producers and consumers as well as the Government itself, the declared commitment to "voluntary measures" stands as an empty promise.

## **Electricity production and use**

The Government's Report acknowledges that electricity demand has risen dramatically over the past decade, reaching 7.7 percent annual growth in recent years. The Report also states that while current electricity production is largely dependent on oil and coal, a 1997 Government decision calls for diversification through the large-scale introduction of natural gas. More specifically, the Report refers to a commitment by the Israel Electric Corporation to phase out old oil-powered stations and replace them with natural gas-fueled turbines by 2005.

For many years, the Electric Corporation has avoided investing in sulfur dioxide scrubbers and other essential pollution-control technology at aging oil-fired power stations in Tel Aviv, Haifa and Ashdod. To ward off public pressure and Government enforcement actions, the Corporation has repeatedly asserted that these facilities would be converted to clean-burning natural gas as soon as it became available. While the supply of gas seems closer today than in the past, the Electric Corporation's oil-burning plants continue to contribute significantly to nitrogen oxide, particulate matter and sulfur dioxide loadings in these three metropolitan areas.

Plans for a natural gas transmission network have been prepared, but the expected source of gas supplies remains in dispute. While substantial gas deposits have been discovered in Israel's Mediterranean territorial waters, no final decision has been reached regarding the exploitation of this gas to meet Israel's near-term needs. Delays in reaching a decision, which requires formal Knesset approval, derive in part from the expectation that cheaper gas supplies may be obtainable from Egypt or the Palestinian Authority. Yet in the current political climate, the likelihood of reaching a long-term supply arrangement with Israel's neighbors remains in doubt.

During the past several years, the Electric Corporation has built a number of new “gas turbines” to boost electricity during peak periods. Despite their promising name, these turbines currently rely on diesel fuel, considered an interim energy resource to be employed until natural gas becomes available. As of 2000, over 5 percent of Israel’s electricity was generated by these units,<sup>10</sup> operating at relatively low caloric efficiency and yielding relatively large quantities of nitrogen oxide, particulate pollution, and sulfur dioxide. With several additional turbine units nearing completion, Israel’s use of diesel for power generation can be expected to rise substantially in the coming years. Even once natural gas is available, the timetable for converting diesel-fired turbines to gas is uncertain given the Corporation’s declared investment priority of converting older oil-burning plants to gas.

While the Electric Corporation may eventually convert its oil-burning power plants to natural gas, it has no such plans for the massive coal-burning facilities now operating at two Mediterranean coastal sites. Coal consumption for electricity production in Israel rose from 3.79 million tons in 1990 to 10.35 million tons in 2000.<sup>11</sup> As of 2000, coal generated 70.6 percent of the nation’s overall electricity output.<sup>12</sup>

Already highly dependent on coal, Israel’s official policy is to press for an even higher rate of coal reliance in the years ahead. In August 2001, Israel’s Infrastructure Minister gave preliminary approval to a proposed new 1100-megawatt coal-burning power station in Ashqelon, despite opposition to the plant by environmental groups as well as two government bodies – the Environment and Finance Ministries. At a time when new coal-burning power plants are generally not being built in advanced industrial nations, it is disturbing that Israel continues to expand its coal dependence. Compared to power stations using natural gas, coal-burning plants produce six times the sulfur dioxide and nearly 50 times the particulate emissions per kilowatt hour of electricity generated. In addition, they emit over twice as much carbon dioxide and five times the level of nitrogen oxides per kilowatt hour than plants operating on natural gas<sup>13</sup> – significantly boosting Israel’s contribution to global warming.

In November 2001, the Israel Union for Environmental Defense filed a petition before Israel’s Supreme Court, claiming that the Infrastructure Minister’s decision favoring additional coal-based electricity production was arbitrary and unreasonable, failing to take adequate account of the environmental, health and economic factors favoring natural gas as the fuel of choice for new power generation. The petition is pending.<sup>14</sup>

### *Renewable energy resources*

The Government's Report credits Israel as a pioneer in developing renewable energy technologies. According to the Report, "some 80 percent of all water heating requirements" are met through solar collectors. Beyond this current solar energy application, the Report refers to renewable energy research experiments ranging from solar-thermal and photovoltaic research at the Ben-Gurion Solar Energy Research Center to the heat-concentrating Solar Tower at the Weizmann Institute of Science.

Given Israel's very high level of year-round solar radiation and its advanced state of technological development, the nation has fallen far short of its potential for demonstrating the widespread practical potential for renewable energy use. The Report states that the Electric Corporation's intention is to supply 20 megawatts of electricity from "environment-friendly" power plants by 2010. In addition, brief reference is made to a 6-megawatt wind farm now in operation, a 3-megawatt Solar Tower currently used for research purposes, and a planned commercial solar power conversion system that will fuel a 250-kilowatt gas turbine.

The combined electricity from these current and planned facilities amounts to less than 30 megawatts, out of a total electricity network that, by 2010, will substantially exceed 14,000 megawatts if demand continues to grow at its current rate of 7 percent a year. Even compared to today's total installed capacity of slightly more than 9,000 megawatts,<sup>15</sup> 30 megawatts of renewable resource-derived electricity would contribute a mere 0.3 percent to total electricity generation.

Steps are urgently needed to open up the market for renewable energy use in Israel. The Israel Electric Corporation's refusal, to date, to offer two-way metering for household-based photovoltaic arrays and other small-scale electricity generators is one of several ongoing obstacles to the introduction of alternative power-generation technologies. In addition to facilitating two-way metering, the Government should offer investment tax credits and other economic incentives to encourage investment in renewable resource-based electricity production.

### *Energy conservation*

The Government's Report identifies energy conservation as another component of Israel's energy policy, pointing to a toll-free information hotline as well as other Government-funded sources of information on

energy conservation and appliance efficiency. The Report acknowledges, however, that these steps “have not had a significant impact” and that current fuel subsidies may pose a market barrier to competition by technologies based on renewable resources.

In contrast to the Government’s substantial funding of publicity campaigns promoting water conservation, particularly during the recent drought years, there has been no concerted effort by the Government or the Electric Corporation to highlight the need for energy conservation. To the contrary, continued rapid growth in electricity demand is the driving assumption behind the Infrastructure Ministry’s endorsement of expanded coal-fired electricity generation, with the Electric Corporation pressing strongly for the development of new installed capacity.

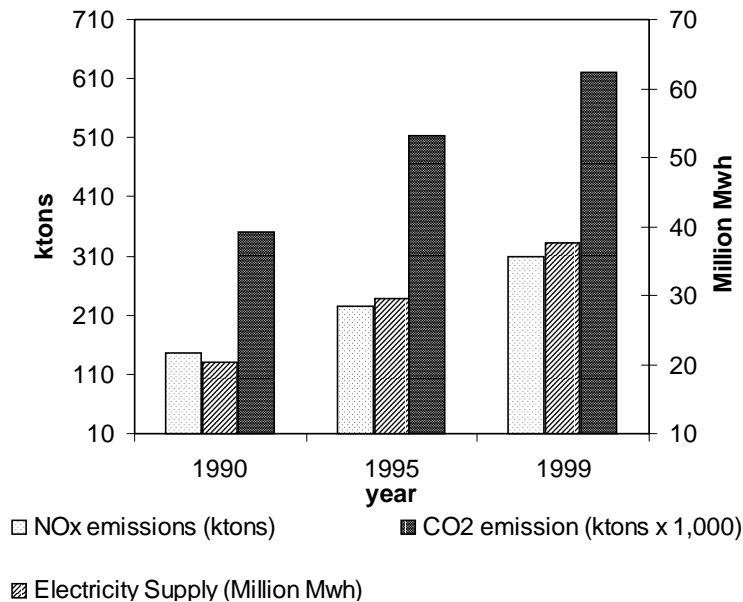


Figure 1: Greenhouse gas emissions and electricity production trends in Israel. 1990–1999.

The fact that electricity consumption has been increasing at three times Israel’s rate of population growth points clearly to the need for vigorous and innovative measures to conserve electricity. A genuine commitment to this challenge by government, industry and citizen groups is essential. Beyond public service advertising and other educational tools to promote energy conservation, the Government should review current fuel subsidies that allow for the provision of electricity to residential customers at prices well

below those charged in many other developed nations. According to data published by the Electric Corporation, Israeli residential customers pay little more than one-third the rate charged in Japan, less than half the price paid in Denmark, and substantially less than residential customers pay in Germany and Spain.<sup>16</sup> It should be added that, from 1990 to 2000, the real price of electricity supplied to residential customers dropped by 17.1 percent.<sup>17</sup>

Along with the Government's misguided policies, there has been no sustained NGO-led campaign to raise public and official awareness of the need to conserve energy. Similarly, there has been no orchestrated public pressure to provide financial and other incentives favoring renewable energy as a partial substitute for Israel's overwhelming reliance on fossil fuels. If Israel is to pursue the ultimate goal of the Climate Change Convention, rather than simply complying with its procedural reporting requirements, a shared commitment by government agencies, industry and citizen groups to promote energy conservation and renewable energy use is essential.

### *Energy and Israel's water crisis*

A discussion of Israel's rapid rise in electricity demand would not be complete without relating this trend to the Government's ambitious plans for seawater desalination. According to Government plans, a series of desalination facilities will commence operating by 2004, supplementing existing freshwater supplies by approximately 200 million cubic meters of water annually.

The need for a far-reaching Israeli commitment to water conservation is discussed in a separate chapter of this report. For purposes of the present chapter, it is important to note that desalination, as a "supply-side" response to the nation's mounting water deficit, comes at an environmental price. Desalination is an energy-intensive technology, requiring an estimated 4 kilowatt hours of electricity per cubic meter of desalinated water.<sup>18</sup> Assuming that Israel meets its target of generating 200 million cubic meters of desalinated water by 2004, an additional 90 to 100 megawatts of power-generating capacity will be needed. Locally, this added electricity demand will translate into higher air pollution levels, varying according to the choice of fuel at new or expanded power plants. Globally, Israel's contribution to greenhouse gas emissions will also rise correspondingly.

## **The transport sector**

With motor vehicle ownership approaching 2 million – nearly double the number of vehicles on the road in 1990 – and with total vehicle travel having nearly doubled during the same period,<sup>19</sup> Israel's transport sector has a major and growing impact on local air quality as well as global greenhouse gas emissions. Vigorous efforts to improve the environmental performance of this sector are urgently needed.<sup>20</sup>

The Government's Report states that “[e]fforts have been made to improve fuel quality and to update emissions standards” for motor vehicles, referring to the introduction of mandatory catalytic converters on 1993 model-year cars and the intended phase-out of lead as a fuel additive by the end of 2002. Israel's lead phase-out is, indeed, under way, although there is no approved timetable for the final withdrawal of lead from all automotive fuels. Meanwhile, leaded fuel continues to comprise some 43 percent of the petrol supplied to the transport sector, even though only 14 percent of Israeli motor vehicles actually require leaded gas or lead-replacement fuel for their effective operation.<sup>21</sup>

The Government's Report also points to recent progress in reducing the sulfur content of diesel fuel – a key precipitator of particulate pollution from diesel vehicles. As a result of recent improvements, the maximum sulfur content of diesel transport fuel has dropped from 0.2 percent to 0.035 percent. Moreover, the country's two major bus companies, Egged and Dan, have been ordered to use ultra-low sulfur diesel fuel meeting the European Union's “City Diesel 2000” standard (0.015 percent sulfur) on their urban routes. Even lower-sulfur “City Diesel 2004” fuel (0.005 percent sulfur) was to be introduced in the Fall of 2001. The Israel Union for Environmental Defense, a non-governmental advocacy group, is now pressing for the mandatory adoption of “City Diesel 2004” fuel for all private as well as public transport uses.

The importance of reducing particulate pollution from Israel's transport sector has been underscored by recent and ongoing risk assessment studies. In one study, it was estimated that small particulate matter (PM<sub>10</sub>) generated by motor vehicles caused 293 premature deaths in Tel Aviv's over-30 population during 1997, representing seven percent of the 4048 deaths not caused by accidents among Tel Aviv's over-30 population.<sup>22</sup> In another, ongoing study of air pollution in two major metropolitan areas (Tel Aviv and Ashdod), particulate pollution has again been identified as the

leading estimated cause of illness and premature death among five pollution parameters examined.<sup>23</sup>

Non-governmental organizations have played, and continue to play, a key role in strengthening measures to reduce particulate pollution from the transport sector. Beyond efforts to lower the sulfur content of diesel fuel, persistent non-governmental pressure led to Environment Ministry action to reduce pollution from the Egged and Dan bus companies. Over many years, the Ministry took no action addressing the companies' inadequate steps to upgrade their fleets and adopt cleaner fuels. In June 2000, the Israel Union for Environmental Defense filed a Supreme Court petition challenging the Ministry's inaction.<sup>24</sup> Faced with the prospect of defending itself before the Court, the Environment Minister finally issued decrees against the bus companies in June 2001, demanding specified reductions in nitrogen oxide, hydrocarbon, and particulate matter emissions. Egged, the larger of the two companies, has since filed a Supreme Court petition protesting the Minister's order.<sup>25</sup>

While the Government has belatedly taken steps to reduce pollution from diesel transport vehicles, it has made no changes in the highly imbalanced tax structure favoring diesel. According to a 1996 World Bank survey of transport fuel pricing in 100 nations, the only nation surpassing Israel's price bias favoring diesel was Nigeria, where a liter of diesel was sold at 23 percent of the price of petrol. Israel, at the time, sold diesel at 25.8 percent of the price of petrol. Spain – often Israel's benchmark in the European Union – priced diesel at 74.7 percent of the price of petrol, while in France and Germany, the rates were 69.5 percent and 66.6 percent, respectively. In the United States, by contrast, diesel sold at 89.7 percent of the price of petrol.<sup>26</sup>

In the autumn of 2000, Israel's Finance Ministry tentatively proposed a moderate increase in the excise tax on diesel fuel to the Knesset's Finance Committee. Despite environmental movement support for this measure, intensive lobbying by the Freight Haulers Association quickly defeated it. Predictably, diesel continues to be the "fuel of choice" for small as well as large commercial vehicles, corporate passenger vehicle fleets, the Israeli military (which operates the nation's largest passenger-vehicle fleet), and a growing number of private car owners.

Inadequate roadside enforcement of motor vehicle pollution control standards is a further obstacle to protecting Israel's air quality. Authority for roadside vehicle inspections is loosely shared by the Environment and

Transport ministries, yet neither ministry fields the equipment or personnel needed to project a strong enforcement presence. This problem is among the issues now being examined by a joint NGO–Government working group on mobile source enforcement, coordinated by the Arava Institute for Environmental Studies. To fill the national enforcement gap, the Haifa Area Association of Towns has adopted a by-law authorizing local officials to conduct roadside motor vehicle emissions checks, including the power to fine vehicle owners for non-compliance with emissions standards, and the Tel Aviv City Council has given preliminary approval to a municipal by-law achieving the same purposes.<sup>27</sup>

While making some progress in reducing emissions from conventional-fuel vehicles, the Government has done little to promote the use of alternative-fuel vehicles. In one initially promising move, the Government issued a decision setting a December 2000 deadline for relevant ministries to take prescribed steps enabling the import and use of liquefied petroleum gas (LPG) vehicles. The deadline has long passed as of the time of this writing, and the necessary measures have yet to be taken.<sup>28</sup>

### **Production and use of ozone-depleting chemicals**

The Government's Report states categorically that Israel is in compliance with all provisions of the Montreal Protocol on Substances that Deplete the Ozone Layer and its amendments. It further declares that the Government is implementing a strategy "to phase out import, consumption and production of ozone-depleting substances in accordance with the timetables set in the protocol and amendments."

Although a small nation, Israel is one of the world's two primary producers of methyl bromide, a "controlled substance" under the Montreal Protocol. Accounting for roughly one-third of global output, Israel ranks second only to the United States in its production of the compound. According to the U.S. Environmental Protection Agency, human-made methyl bromide is responsible for about 4 percent of ozone depletion over the past 20 years, with use of the compound for agricultural fumigation accounting for about 2.5 percent of overall ozone depletion.<sup>29</sup>

The Government's Report states very generally that "production of methyl bromide has been restricted and control is ensured by means of special conditions incorporated into the business license of the Israeli manufacturer." The Report, however, provides no detail regarding the

current level of methyl bromide manufacture by Dead Sea Bromine, the Israeli company that produces the substance. According to the Protocol's phase-out targets, Dead Sea Bromine's production in 2001 and 2002 must be no more than 50 percent of its 1991 output level. By 2005, the company must achieve "zero" production – with certain exceptions.<sup>30</sup> For example, production for "critical uses" may continue beyond the phase-out deadline, yet the Parties to the Montreal Protocol have not defined what these uses may be. A further exception applies to production that meets the "basic domestic needs" of developing nations.<sup>31</sup> Finally, production of methyl bromide for quarantine and pre-shipment applications is entirely excluded from the Protocol's restrictions.<sup>32</sup>

Effective oversight of compliance with methyl bromide phase-out targets is greatly complicated by these various exceptions to the phase-out deadlines. In Israel's case, accountability is further compromised by the involvement of Dead Sea Bromine in methyl bromide manufacture outside Israel's borders. In response to a recent inquiry, Dead Sea Bromine has generally acknowledged that it has a business partnership with a Chinese corporation that manufactures methyl bromide. However, the extent of its investment in this corporation and the quantities of methyl bromide produced and marketed through this arrangement have not been divulged to date.<sup>33</sup>

Israel's cooperation with China is particularly disturbing in light of China's failure to ratify the 1992 "Copenhagen Amendment" to the Montreal Protocol, the critical provision designating methyl bromide as a controlled ozone-depleting substance under the Protocol. As China has not subscribed to the Copenhagen Amendment, it remains exempt from any obligation to reduce its production and use of methyl bromide, apparently giving Dead Sea Bromine a major avenue to continued manufacture of the substance beyond the limits applicable to Israel under the terms of the Protocol.

Of further concern is the fact that Israel has failed to ratify the 1997 "Montreal Amendment" to the Montreal Protocol, barring Parties from engaging in the trade of methyl bromide with non-Parties.<sup>34</sup> Looking only at economic factors, it is easy to understand the Government's decision not to ratify the trade ban. So long as the other leading producers of methyl bromide – the U.S. and China – refuse to sign onto the trade ban, Israel's ratification of the Montreal Amendment exposes Dead Sea Bromine to the predictable loss of valued customers to its competitors. Yet, from an environmental perspective, the refusal of Israel and other producer-nations to subscribe to the trade ban severely erodes the integrity and effectiveness of the phase-out regime. It is therefore vital that, the Government of Israel –

ideally though not necessarily together with the United States and China – ratify the Montreal Amendment.

Greater transparency in the Government of Israel's oversight of the Protocol is also essential. The inter-ministerial committee charged with overseeing implementation of the Montreal Protocol, chaired by the Environment Ministry, includes no NGO representatives and to date has invited no public participation. This utter lack of transparency leaves the public with no reliable means of evaluating the degree to which Israel is taking necessary and appropriate measures to achieve the declared purposes of the ozone protection regime.

## Conclusions

A number of urgent steps should be taken by the Government of Israel to comply more fully with the overriding purposes of the Climate Change Convention and the ozone protection regime established by the Vienna Convention and the Montreal Protocol. Beyond these measures, the Government should genuinely undertake to advance the broader goals of Agenda 21 pertaining to atmospheric pollution and air quality protection. Priority should be given to the following:

- **Actions to reduce health-endangering air pollution from the transport sector.** Measures that should be taken in this sector include: adoption of the EU 2004 standard for low-sulfur City Diesel (0.005% sulfur) for all transport uses; tax reforms substantially narrowing the price differential between diesel and petrol; a complete phase-out of leaded fuel by the end of 2002; vigorous enforcement of motor vehicle emissions standards at the national and local levels; full implementation of the pollution control reforms applicable to the nation's two major bus companies under the recently-issued official decrees; and expedited entry of LPG and other clean-fuel vehicles for commercial and private use.
- **Steps to curb greenhouse gas emissions.** In addition to ratifying the Kyoto Protocol, Israel should move beyond the mere inventorying of greenhouse gas emissions and sinks to a genuine, systematic campaign geared toward curbing the nation's rapidly increasing greenhouse gas emissions. Specifically, a high-profile energy conservation campaign should be matched with real investment in energy-saving technology, as means of slowing the nation's ongoing rampant growth in electricity

consumption. Market signals should be reformed toward the same end, raising electricity prices to close the gap between Israel and other developed nations, while at the same time providing real and substantial subsidies to the development of non-polluting renewable resource-based energy applications. In the transport sector, strong measures should also be taken to strengthen public transit and non-motorized modes of mobility.

- **Measures to protect the ozone layer.** As a first step toward ensuring its good-faith commitment to ozone layer protection, the Government of Israel should immediately ratify the 1997 Amendment to the Montreal Protocol, barring trade in methyl bromide with non-Parties. To build public confidence in the steps being taken to phase out production and use of ozone-depleting compounds (most notably methyl bromide), public representatives should be invited to participate in, or at least observe, the meetings of the inter-ministerial committee established to oversee compliance with the Montreal Protocol. Finally, Dead Sea Bromine's investment in methyl bromide manufacture in China – for all practical purposes a non-Party to the Protocol as applied to methyl bromide – should be subject to rigorous public scrutiny.

## Notes

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- <sup>1</sup> Israel Electric Corporation, *Statistical Report – 2000*, Table 83 (in Hebrew).  
<sup>2</sup> *Ibid.*, Table 78.
- <sup>3</sup> Central Bureau of Statistics, *Statistical Abstract of Israel – 2000*, Table 18.15.  
<sup>4</sup> *Ibid.*, Table 1.7.
- <sup>5</sup> Per capita emissions are calculated by dividing overall CO<sub>2</sub> emissions by population: 4.660 million in 1990 and 6.125 million in 1999.
- <sup>6</sup> Israel Ministry of the Environment, *Environmental Indicators in Israel* (2001).  
<sup>7</sup> *Statistical Abstract of Israel*, Table 1.7.
- <sup>8</sup> Israel Central Bureau of Statistics, <http://www.cbs.gov.il>.
- <sup>9</sup> *Statistical Abstract of Israel – 2000*, Table 6.19.
- <sup>10</sup> Israel Electric Corporation, *Statistical Report – 2000*, Table 6.  
<sup>11</sup> *Ibid.*, Table 10.
- <sup>12</sup> *Ibid.*, Table 6.
- <sup>13</sup> Dr. Ayala Tamari, “Gas for Electricity Production: The Natural Choice,” *Yarok Cahol Lavan*, Aug.–Sept. 2000 (in Hebrew). Dr. Tamari served as Head of the Environmental Department of the Israel Infrastructure Ministry (previously the Energy Ministry) from 1987 to 1999.
- <sup>14</sup> *Israel Union for Environmental Defense v. Minister of National Infrastructure*, No. 9032/01.

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- <sup>15</sup> Israel Electric Corporation, *Statistical Report – 2000*, Table 75.
- <sup>16</sup> As of 1 January 2000, the price charged to Israeli residential customers was \$0.091 per kilowatt hour (KWH), whereas in Japan, the comparable charge was \$0.25 per KWH; in Denmark, \$0.19 per KWH; in Germany, \$0.134 per KWH; and in Spain, \$0.117. Source: Israel Electric Corporation, *Statistical Report – 2000*, Table 86.
- <sup>17</sup> Israel Electric Corporation table, reprinted in *Haaretz*, 3 July 2001.
- <sup>18</sup> P. Glickstern, “Desalination: The Present Situation and Future Possibilities,” in Barry Rubin, ed., *Efficient Use of Limited Water Resources* (Begin–Sadat Center, Bar Ilan University, Dec. 2001), p. 16 (in Hebrew).
- <sup>19</sup> Total land transport rose from 18.7 billion kilometers in 1990 to 35 billion km. in 1999, with the primary growth occurring in private vehicle travel (12.2 billion km. to 21.7 billion km.). *Statistical Abstract of Israel – 2000*, Table 18.17.
- <sup>20</sup> While major shifts in transport infrastructure investments are essential (e.g. introducing urban and inter–urban rail as well as encouraging non–motorized mobility), recommendations on this subject are presented in a separate chapter of this report.
- <sup>21</sup> Energy Engineering Center, Faculty of Mechanical Engineering, Technion – Israel Institute of Technology, *Strategy for Removing Lead from Petrol in the State of Israel*, Interim Report #2, Research #034–177 (August 2000), p. 7.
- <sup>22</sup> Ginsberg et al., “Mortality from vehicular particulate emissions in Tel Aviv–Jafo,” in *World Transport Policy and Practice* 4/2 [1998], 27–31.
- <sup>23</sup> This study is a joint undertaking of the U.S. Environmental Protection Agency, Israel’s Environment Ministry, and the Israel Union for Environmental Defense. Its results are expected to be released early in 2002. The pollution parameters examined by this study are particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), nitrogen dioxide, sulfur dioxide, and ozone.
- <sup>24</sup> *Israel Union for Environmental Defense v. Ministers of Environment, Infrastructure, and Transport, and the Egged and Dan Bus Cooperatives*, No. 3974/00.
- <sup>25</sup> *Egged Bus Cooperative v. Ministers of Environment, Infrastructure, Transport, and Industry, and the Israel Union for Environmental Defense*, No. 5208/01.
- <sup>26</sup> Faiz et al., *Air Pollution from Motor Vehicles: Standards and Technologies for Controlling Emissions* (World Bank, 1996). Percentages are derived from diesel and petrol price comparisons appearing in Table A3.3.2.
- <sup>27</sup> The Tel Aviv by–law, adopted in principle by the City Council in August 2001, is the outcome of a joint campaign of the Council’s two–member Green Party faction and the Israel Union for Environmental Defense.
- <sup>28</sup> In January 2001, the Israel Union for Environmental Defense filed a Supreme Court petition – still pending – calling on the relevant government agencies to meet their obligations facilitating LPG use by the transport sector. *Israel Union for Environmental Defense v. Ministries of Infrastructure, Transport and Environment*, No. 327/01.

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- <sup>29</sup> U.S. Environmental Protection Agency, Methyl Bromide Phase Out Web Site, <http://www.epa.gov/ozone/mbr/mbrqa.html>.
- <sup>30</sup> These deadlines, set forth in Adjustments to Article 2H of the Montreal Protocol as agreed at the Ninth Meeting of the Parties in September 1997, are automatically binding on all Parties.
- <sup>31</sup> Montreal Protocol, Art. 2H(4) & (5). The phase-out schedule applicable to methyl bromide production directed at meeting “basic domestic needs” in developing nations extends through 1 January 2015. See *Handbook for the International Treaties for the Protection of the Ozone Layer* (Ozone Secretariat, UNEP, Fifth Edition, 2000), pp. 320–21.
- <sup>32</sup> Montreal Protocol, Art. 2H(6). As an admittedly crude gauge of the magnitude of methyl bromide use for quarantine and pre-shipment applications globally, it is worth noting that these uses constitute roughly 10 percent of total U.S. consumption of the compound, according to the USEPA. <http://www.epa.gov/ozone/mbr/mbrqa.html>.
- <sup>33</sup> Letter from Efrati, Galili & Co., 6 December 2001, attorneys representing Dead Sea Bromine, in response to a formal query submitted by the Israel Union for Environmental Defense, 14 November 2001.
- <sup>34</sup> Israel approved the Montreal Amendment in Government Decision No. 2268, 17 August 2000. However, in a letter to the Government Secretary dated 17 June 2001, Israel’s Foreign Minister Shimon Peres announced that the inter-ministerial committee charged with overseeing the Montreal Protocol’s implementation had reversed its earlier endorsement of the trade ban, now recommending a freeze on all steps toward ratification of the Amendment.