OFFICE OF THE STATE COMPTROLLER

The Treatment of Greenhouse Gas Emissions in Israel

STATE OF ISRAEL

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AND OMBUDSMAN

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1. The emission of greenhouse gases into the atmosphere is a world-wide phenomenon that causes, among other things, global warming. In the early 1990's the nations of the world began working out an internationally agreed policy for reducing these emissions.

The Government of Israel also began taking steps to reduce greenhouse gas emissions. In 1996 the Government ratified the United Nations Framework Convention on Climate Change of 1992, whose purpose was to stabilize the amount of greenhouse gases in the atmosphere at a level that would not endanger the climate system. In 2004 it ratified the Kyoto Protocol which imposed gas emission reduction quotas for 2008-2012 on developed states. The Protocol does not apply to the State of Israel.

Those who deal with environmental quality have designated the 21st century as "the green century". A country which readies itself to reduce greenhouse gases will benefit from economic development and technological progress. A country which does not do so is liable to see its international standing adversely affected, to the point of being subjected to limitations and sanctions. Therefore, the reduction of greenhouse gas emissions must be examined not only in the light

of the formal obligations to do so, but also from the standpoint of the long-term social and economic benefits involved.

2. In December 2009 the 15th U.N. Conference on Climate Change will be held in Copenhagen, Denmark, with the aim setting a reduction target for greenhouse gas emissions after 2012. In anticipation, the European Organisation of Supreme Audit Institutions (EUROSAI) initiated a joint audit of how the issue is handled in various countries. Ten countries took part in the audit which was coordinated by the Supreme Chamber of Control of Poland. Israel's State Comptroller's Office participated for the first time, having been accepted as a member of EUROSAI in September 2007.

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Jerusalem, Israel, Kislev 5770
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Abstract

The rise in the concentration of greenhouse gases[1] in the atmosphere over the last 150 years and particularly over the past 30 years, is liable to cause global warming of the planet Earth. At the present rate of warming, extremes of weather - storms, floods, and drought - are likely to multiply. Melting glaciers and the rising sea level may inundate large areas while other areas will suffer a decrease in precipitation and severe water shortages.

In the last two decades actions have been taken at the international level to reduce greenhouse gas emissions and to prevent global warming: in 1992 the United Nations Framework Convention on Climate Change[2], which aimed at stabilizing the extent of greenhouse gases in the atmosphere at a level that does not harm the climate system, was approved Since then there has been a series of international conferences to advance the implementation of the Climate Convention's principles. In 1996 Israel ratified the Climate Convention; in 2004 the Government ratified the Kyoto Protocol, which imposed gas emission reduction

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1 The main greenhouse gases are carbon monoxide (CO_2), emitted mainly by fuel combustion in electric power stations, industry and transportation; methane (CH_4), emitted by the breakdown of waste material in the absence of oxygen, in garbage dumps and effluent purification plants, in the digestive processes of livestock, and the cultivation of rice in flooded fields; nitrous oxide (N_2O), also emitted by fuel combustion and from microbial processes operating on nitrogen-based fertilizers which leach into water and soil, chlorofluorocarbons (CFC's), freon gas, which also damages the stratosphere's ozone layer, and ozone (O_3) created in the air layer closer to the ground as a result of chemical processes caused by sunlight acting on pollutants in the air.

2 The United Nations Framework Convention on Climate Change.

quotas for 2008-2012 on developed countries. It should be noted that the Kyoto Protocol does not apply to Israel.

As part of a joint international audit by countries participating in the European Organisation of Supreme Audit Institutions (EUROSAI), from March to July 2009 the Israel State Comptroller's Office examined the treatment of greenhouse gas emissions in Israel[3]. Among its findings:

Observing and Monitoring Climate Change: **The Israel Meteorological Service is responsible for the country's meteorological and climate observations. It has difficulty in conducting long-term monitoring of climate change: it lacks professional personnel, has difficulty in maintaining its network of meteorological stations, and only partially processes the data it collects for monitoring purposes.**

***Activities for Reducing Greenhouse Gases Emissions*: In 1996 and 2001 the Government decided to define its policy on the reduction of greenhouse gas emissions. Accordingly, it set up an inter-ministerial committee, headed by the Ministry of Environmental Protection which commissioned studies on various means of reducing such emissions in the various economic sectors as a basis for a national program of action. However, as of the termination of the audit in July 2009, the Ministry had not worked out a national program of action for reduction of greenhouse gas emissions nor had it finished preparing the professional infrastructure required[4].**

Monitoring greenhouse gases Emissions: **At the national level, the Central Bureau of Statistics is responsible for monitoring**

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3 In 2007 the Israel State Comptrollers Office was accepted as a member of EUROSAI.

4 In November 2009 upon conclusion of the audit report, the Minister for Environmental Protection wrote to the State Comptroller informing him that the Ministry had completed the professional infrastructure required for preparing a national program of action to reduce greenhouse gas emissions in Israel, and that it had formulated a policy and targets. The Minister added that the Cabinet must discuss this policy as soon as possible and decide on the actions to be taken to reduce the emissions.

greenhouse gas emissions. Since 2005 it has been calculating annually the amount of major greenhouse gases. Nevertheless, the data is not sufficiently detailed for effective supervision and control of the sources of the emissions. Likewise, the Bureau still does not have statistical data on the reduction of emissions stemming from the Clean Development Mechanism (CDM)[5] and the contribution of newly-developed technologies which make it necessary to change the statistical coefficients used by the Central Bureau of Statistics. In addition, the monitoring of greenhouse gas emissions is not anchored in legislation, regulations, or office procedures. The decision to calculate greenhouse gas emissions was an internal decision of the Bureau based on the authority granted it by the Statistical Ordinance to collect environmental data. In the opinion of the State Comptroller's Office, the Bureau's important initiative should be supplemented by official regulation of greenhouse gas emission monitoring - detailing who is responsible for monitoring, how it should be conducted, the data that should be collected, and the amount of detail required in accordance with the types of gas and their sources.

Summary

According to those dealing with the environment, the 21st century will probably be labeled the "green century". A country that readies itself for the reduction of greenhouse gas emissions will enjoy the accumulation of knowledge, technological breakthroughs, patent registrations, and growth in exports. In contrast, a country that does not do so is liable to be adversely affected from the standpoint of its international standing, to the point of being subjected to limitations and sanctions.

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5 The Clean Development Mechanism (CDM) is basically a financial instrument which permits international trade in greenhouse gases. The CDM was established in 1997, as part of the Kyoto Protocol. It allows developed countries to purchase "emission reduction rights" from developing countries, instead of reducing their greenhouse gas emissions, and is intended to assist developed countries to meet their Kyoto Protocol obligations and assist developing countries to advance sustainable development projects.

Accordingly, the implementation of means for reducing greenhouse gas emissions should be examined, not only from the aspect of formal obligations, should they be imposed on Israel in future and from the strictly budgetary aspect, but also from the standpoint of the long-term social and economic benefits involved. In order to assure the shaping and implementation of an effective policy for reducing greenhouse gas emissions, both the network of observation and monitoring of climate change and the system of monitoring of greenhouse gas emissions must be developed and expanded.

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Foreword

1. One of the conditions for life on Earth is greenhouse gases in the surrounding atmosphere: gases that trap some of the longwave radiation emitted by the earth and transformed into heat[6]. Without these gases the temperature on earth would plummet from an average of 15 degrees Celsius to an average of 18 degrees Celsius below zero. However, too much greenhouse gas in the atmosphere is liable to cause global warming - a process which many scientists believe has indeed been happening in the last 150 years, and especially in the last thirty years. Fuel combustion is the primary cause of the increased concentration of greenhouses gases in the atmosphere[7].

It is predicted that if the current rate of warming continues the average temperature of the planet will rise by 1.5-3.5 degrees Celsius within the next 30-40 years. Extreme weather conditions will multiply, including

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6 The main greenhouse gases are: carbon dioxide (CO_2), produced mainly by fuel combustion of electric power stations, industry, and motor vehicles; methane (CH_4), produced by waste deposits and sewage treatment installations caused by the decomposition of organic waste without oxygen, from the digestive processes of animals, and rice growing in flooded paddies; nitrous oxide (N_2O), produced by fuel combustion and microbial processes in the ground and in water affected by the use of nitrogen-based fertilizers; chloro-fluoro-carbons (CFCs) - freon gases, which harm the stratosphere's ozone layer; and ozone (O_3) produced in the lower atmosphere as a result of chemical reactions involving air pollutants and solar radiation.

7 See the website of the Ministry of Environmental Protection: www.sviva.gov.il.

storms, floods, and droughts. Glaciers will melt and the sea level will rise by some 50-140 centimeters in the next 100 years, which will cause the inundation of coasts and low-lying areas. In various regions, precipitation will decrease and cause a growing shortage of water for drinking and agriculture.

2. In the last two decades efforts have been made at the international level to lower the emission of greenhouse gases and prevent global warming: 154 states signed the 1992 United Nations Framework Convention on Climate Change (hereafter - the Climate Convention), which aimed to stabilize globally the concentration of greenhouse gases in the atmosphere on a level that does not endanger the climate system. Since then a number of international conferences have taken place to apply the principles of the Climate Convention. Israel ratified the Climate Convention in 1996 and established an inter-ministerial committee to draw up a governmental policy for reducing greenhouse gas emissions.

The "Kyoto Protocol" was formulated at the third conference of the Climate Convention, which took place in December 1997 in Kyoto, Japan, and in which 161 countries participated, including Israel. The Protocol imposed on developed countries[8] quotas for reducing levels of greenhouse gases, in the period 2008-2012, in comparison with the levels measured in 1990. It created a mechanism to help them reach their goals, including the Clean Development Mechanism - CDM[9].

At the 13th Conference which took place in Bali, Indonesia on December 2007, the participants decided to defer negotiations on greenhouse gas reduction goals for the period following 2012 to the Copenhagen Conference in December 2009.

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8 The Climate Convention classifies all participating countries as developed or developing countries. Developed countries are those industrialized countries which in the past contributed to the increase in greenhouse gases in the atmosphere and which have the economic and institutional ability to deal with the problem. All other countries, and Israel among them, were classified as developing countries.

9 CDM - the Clean Development Mechanism - is basically a financial instrument that allows international trade in greenhouse gases. It was established in 1997 as part of the Kyoto Protocol and permits developed countries to acquire "emission reduction rights" from developing countries instead of actually reducing their own emissions. It is intended to help developed countries attain their emission reduction goals while helping developing countries promote sustainable development projects.

3. In January 2009 several countries represented in the Organization of European State Audit Institutions (EUROSAI) signed a joint agreement to conduct audits of greenhouse gas reduction[10]. In that framework the State Comptroller's Office of Israel examined how Israel deals with greenhouse gas emissions[11]. The audit plan was drawn up together with the other member states and related to three main issues: (a) tracking climate change - observing and identifying climate change, analyzing it, and forecasting future changes. (b) actions taken to reduce greenhouse gas emissions - the policies of the national government and the individual ministries responsible for activities which emit greenhouse gases (i.e., those dealing with the energy-producing sector, which is responsible for producing most greenhouse gases), policy implementation, and practical results. (c) monitoring greenhouse gas emissions and issuing reports. The audit was conducted from March to July 2009 in the Ministry of Environmental Protection, the Meteorological Service, and the Central Bureau of Statistics. Supplementary examinations were also carried out in the Ministry of National Infrastructures (hereafter - the Ministry of Infrastructures), the Israel Electric Corporation (IEC), the Ministry of Transport and the Ministry of Finance.

Observing and monitoring Climate Change

1. The Israel Meteorological Service, an autonomous unit in the Ministry of Transport, is responsible for conducting meteorological and climatic observations in Israel. Its major tasks are[12]: preparing weather forecasts; establishing, operating, and maintaining a national network of meteorological stations; conducting meteorological observations to ensure that the nation's standard climate data are trustworthy; establishing, operating, and maintaining a national database of basic meteorological data; conducting applied meteorological research; handling Israel's

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10 In 2007 the Israel State Comptrollers Office was accepted as a member of EUROSAI.

11 The following countries participate in the joint audit: Azerbaijan, Cyprus, Denmark, Estonia, Israel, Macedonia, Poland, Russia, Switzerland, and Ukraine. The Supreme Chamber of Control of Poland coordinates the audits.

12 See the website of the Meteorological Service: www.ims.gov.il.

international meteorological activities as a member of the World Meteorological Organization; supplying raw and processed meteorological data for national and international consumers.

The Meteorological Service operates without a basis in primary legislation. As of July 2009, when the audit was completed, a bill from the year 2000, regulating the services to be provided by the Meteorological Service had not yet been enacted.

2. Generating the data needed to forecast climate change requires, among other things, continuous and reliable measurements, over long periods of time, of meteorological parameters; continuous checking of the data received from the meteorological stations; and processing of the data.

The Meteorological Service has encountered difficulties in carrying out the tasks required for long-term monitoring of climate change: it lacks professional personnel and finds it difficult to maintain its network of meteorological stations; historical data typed into the database has not been thoroughly checked; and, until now, the data gathered for monitoring purposes has only been cursorily processed.

In its September 2009 reply to the State Comptroller's Office, the Ministry of Transport stated that "following employee retirements and the cancellation of positions in the Meteorological Service's station maintenance services, and in light of the poor upkeep of the Meteorological Stations, the Service's director has proposed outsourcing such services … the Budget Department in the Ministry of Transport is currently examining the additional budget needed in the framework of the overall Meteorological Service budget, in line with the Ministry of Transport's general priorities in the regular and development budgets." The Ministry added that the Meteorological Service requires the introduction of three more positions in the areas of climate forecasting, climate data processing, and data control. This requirement has been transmitted to the relevant persons in the Ministry of Transport and will be dealt with in accordance with the Ministry's general priorities.

3. The Meteorological Service participates in activities of international organizations in the area of climate change: the Director of the Meteorological Service is Israel's representative in the Intergovernmental

Panel on Climate Change (IPCC), and an Israeli researcher was active in the preparation of the IPCC's fourth report; the Meteorological Service provides data for the operation of solar meteorological station to the World Meteorological Organization (but is not involved in the research activities); and it provides data for the construction of an all-European climate database, which is coordinated by the Netherlands Meteorological Service (but does not participate in their processing).

The integration of the Meteorological Service in international efforts concerning climate change is rather limited and difficult to expand because it lacks suitable computer resources for running seasonal and climatic models and suffers a dearth of research activity in the areas of climate change monitoring and climate forecasting in Israel.

The Ministry of Transport stated in its reply to the State Comptroller's Office that in order to run climate forecasting models the Meteorological Service requires additional budgeting to purchase a suitable computer, and that a budget request would be submitted for the approval of the Ministry's director-general, as part of the 2010 budget.

Reducing Greenhouse Gas Emissions

The main greenhouse gas emitted in Israel is carbon dioxide. In 2007 some 67 million tons of carbon dioxide was released into the atmosphere, constituting some 87% of total greenhouse gas emissions. The main cause of carbon dioxide emissions is fuel combustion, especially for energy production, including the production of electricity (some 63%), and the propulsion of motor vehicles (about 22%). According to the Central Bureau of Statistics, measured in terms of carbon dioxide emissions[13], some 76.8 million tons of greenhouse gases were emitted in Israel in 2007, as compared to 62.7 million tons in 1996 - a 22% increase. On the other hand, greenhouse gas emissions per person, in terms of carbon dioxide went

13 The effect of greenhouse gases is given in terms of the effect of carbon dioxide, the main greenhouse gas, through a specially developed mathematical ratio used by the IPCC.

down from 11.03 tons per person in 1996 to 10.69 tons in 2007, a decline of 3.1%.

Although Israel is not obligated to reduce greenhouse gases by pre-determined amounts the Government of Israel has reached a number of decisions concerning greenhouse gas emissions, and has assumed the following measures:

1. In May 1996 the Government decided[14] to adhere to the U.N. Framework Convention on Climate Change, to ratify the Convention and to establish an inter-ministerial committee to formulate a policy on reducing greenhouse gas emissions. In November 2000 Israel submitted to the U.N. a report on greenhouse gas emissions in its territory and on its policies and activities relating to the issue[15] in accordance with the principles of the Climate Convention which it had adopted. In the report to the U.N. Israel announced its commitment to the formulation and implementation of a national plan, including means for mitigating climate changes. The Government decided in February 2001[16] to take steps to reduce greenhouse gas emissions, based on what the inter-ministerial committee established by the Government in 1996 will conclude. In 2000 and 2001, the Ministry of Environmental Protection, which headed the inter-ministerial committee and coordinated greenhouse gas reduction activities, received studies from experts concerning potential means for reducing greenhouse gas emissions.

Despite the 1996 and 2001 Cabinet decisions, and the studies that had been submitted to the Ministry of Environmental Protection, the Ministry did not formulate definite goals for reducing greenhouse gas emissions or means for attaining the reduction. The activities of the inter-ministerial committee ceased in 2004 without its having submitted to the Cabinet its conclusions regarding the steps that needed to be taken to reduce greenhouse gas emissions.

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14 Cabinet Decision 815 of 5 May 1996.

15 *Israel National Report on Climate Change*: "First National Communication to the Conference of the Parties to the United Nations Framework Convention on Climate Change", State of Israel, Ministry of the Environment, Jerusalem, November 2000.

16 Cabinet Decision 2913 of 15 February 2001.

2. In 2007 the Ministry of Environmental Protection decided to draw up a study examining Israel's readiness to reduce greenhouse gas emissions in the period following 2012, the expiry date of the Kyoto Protocol (hereafter - the study). In order to prepare the study, an external consultant company was hired (hereafter - the external consultants) and an inter-ministerial steering committee was established. In the documentation of the tender in which the external consultants were chosen, it stated that "the services will include … construction and analysis of various schemes for reducing greenhouse gas emissions, calculating their economic costs and benefits, and recommending the optimal policy balancing the reduction of greenhouse gas emissions with the other economic ramifications."

In January 2009 the study was submitted to the Ministry of Environmental Protection and to the inter-ministerial steering committee. Among other things, it included: a forecast of greenhouse gases up to 2025; an analysis of alternatives for reducing greenhouse gas emissions, and sample-based cost-benefit calculations of various relevant measures to be taken; recommendations on policy and the continued efforts needed. In April 2009 the Ministry decided to contact a research institute to prepare a follow-up study which would include an analysis of measures to reduce greenhouse gas emissions, their potential for implementation, and their economic ramifications. In August 2009 the Ministry of Environmental Protection entered into an agreement with an international consulting firm that had conducted greenhouse gas reduction studies for other countries, in order to lay the basis for a national plan of action.

The State Comptroller's Office notes that as far back as 2000 the Ministry of Environmental Protection began ordering studies of steps to be taken to reduce greenhouse gas emissions. Almost a decade later, it has still not consolidated a professional foundation for preparing a national plan of action. The situation points to the Ministry's lack of effectiveness in planning and managing this process[17].

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17 In November 2009 upon conclusion of the audit report, the Minister for Environmental Protection wrote to the State Comptroller informing him that the Ministry had completed the professional infrastructure required for preparing a national program of action to reduce greenhouse gas emissions in Israel, and that it had formulated a policy and targets. The Minister added that the Cabinet must discuss this policy as soon as possible and decide on the actions to be taken to reduce the emissions.

3. In May 2009 the Government decided to establish a ministerial committee to make arrangements for climate change. In June 2009 the ministerial committee adopted the following decisions: (a) to set up a committee of directors-general to prepare for, and adapt to, climate change and greenhouse gas reduction, headed by the director-general of the Ministry of Environmental Protection, and to assign it the task of formulating recommendations for a national plan of action to reduce greenhouse gas emissions. The plan would be submitted for approval to the ministerial committee within one year. The plan was to be based on international agreements and would establish national targets for greenhouse gas reduction; criteria for assessing the objectives of the reduction; formulation and implementation of reduction measures; time frames and milestones; the economic aspects and the budgets necessary for implementation; and output and result indices; (b) work teams would be appointed to formulate plans for the following areas of greenhouse gas reduction: conserving energy and increasing its efficiency; construction and housing; improving efficiency in electricity production; transportation; agriculture; waste; land use; water; renewable energy. The plans of action of the teams would be submitted to the committee of directors-general within six months from the date of the decision. The work teams would also submit interim reports that would serve as a basis for formulating policy towards the convening of the countries participating in the Climate Convention, which would take place in Copenhagen in December 2009. (c) The committee of directors-general would formulate a policy proposal for greenhouse gas reduction in the country, to serve as a basis for further discussion at the Copenhagen Convention. The policy proposal would be submitted to the Cabinet and to the ministerial committee before the Convention convened.

In order to improve air quality and reduce air pollution the Clean Air Law, 2008, was enacted as a means for the protection of human lives and the protection of the environment. The law defines pollutants, and establishes regulations necessary for monitoring their emission. They serve as a basis for the regulation of pollutant emissions that can affect climate change and their monitoring. A system of monitoring of certain pollutants exists in Israel at the national and local levels; since 1992 air quality regulations on the permitted level of ozone emission have been enforced.

In 1996 and 2001 the Government decided to define a policy for reducing greenhouse gas emissions and to take suitable steps to enforce it. To that end an inter-ministerial committee was set up, headed by the Ministry of Environmental Protection, and studies were made of how to reduce greenhouse gas emissions in various economic sectors, as a basis for a national plan of action. However, as of July 2009 when the audit terminated, the Ministry of Environmental Protection had not formulated a national plan for reducing greenhouse gas emissions nor had it finished preparing the professional infrastructure required[18].

The Energy Sector

1. According to the IPCC, the energy sector includes any process in which fuel is burned in order to create energy. While this includes fuel combustion for electricity, heat, and steam for manufacturing and construction purposes, for driving motor vehicles, and for providing heat and energy for dwellings, institutions, etc., the major contributor of the energy sector as a whole to greenhouse gas emissions is fuel combustion for electricity production. Hence, this chapter focuses on greenhouse gas emission resulting from electricity production.

Israel's electricity production system has unique characteristics compared to Western countries, which burden its development and management. These characteristics include the lack of natural sources of fuel, creating dependence on fuel imports from abroad; significant geo-political difficulties in using nuclear energy to produce electricity; geo-political limitations that do not permit connecting to the electricity networks of neighboring countries, thus requiring the establishment of an autarkic electricity grid; and shrunken land resources which limit the expansion of the electricity production system.

According to the data of the Ministry of Infrastructures and of the Electric Corp., greenhouse gas emissions in Israel as a result of electricity production alone amounted to 40.2 million tons of CO_2 in 2008. In 2007 this constituted, in terms of CO_2, 53% of total greenhouse gas emissions; in

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18 See footnote no.17.

other words, more than half of the greenhouse gases emitted in Israel derive from the production of electricity. In 2008 some 65% of electricity was produced by coal, 26% by natural gas, and the rest by diesel and fuel oil. The composition of the fuels has a decisive impact on the level of greenhouse gas emissions - in 2008 the production of one kilowatt of electricity from coal caused the emission of 0.85 kilograms of CO_2, while the use of natural gas caused only 0.47 kg. of CO_2 to be emitted. Changes in the composition of fuels in electricity production found expression in the downward trend of specific emissions of CO_2 in electricity production (specific emissions are the amount of CO_2 produced per kilowatt-hour): between 2003 and 2008 specific emissions went down from 830 grams of CO_2 per kilowatt-hour to 740 grams of CO_2 per kilowatt-hour.

The study previously mentioned forecasts that by 2025, a "business as usual" policy (i.e., a continuation of current policy), would result in a growth of CO_2 emissions from electricity production to as much as 62.3 million tons.

2. In November 2002 the Government decided[19] to encourage the construction of electric plants and power stations using renewable energy (i.e., power produced by sun, wind, water, organic waste, and effluents) by private producers as well as the Electric Corp. Its target was the production of 2% of total electricity by renewable energy sources by 2007, to be increased by one percent every three years so that by 2016 it would reach 5% of total electricity production.

The 2007 target was not achieved: in 2007 only 0.2% of Israel's electricity was produced by renewable energy[20]. Furthermore, according to Electric Corp. data, due to increased electricity production, carbon dioxide emissions increased from 34.6 million tons in 2000 to 40.9 million tons in 2007 - an increase of 18%. At the same time, Israel's greenhouse gas emissions, in terms of CO_2, increased at the same years by only 6% (from 72.4 million tons in 2000 to 76.8 million tons in 2007). It should be noted that the use of natural gas to produce electricity increased from zero in 2000 to 20% in 2007 and 26% in 2008 - a process which moderated the increase in CO_2 emissions in the production of electricity.

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19 Cabinet Decision 2664, 4 November 2002.

20 State Comptroller of Israel, Annual Report No. 59b, "Energy Conservation and the Use of Renewable Energy in Electricity Production".

3. In October 2007 the Ministry of Infrastructures finished preparing a master plan for electricity production for the period 2007 to 2030. It stated that one of its strategic targets was the "long-term reduction of greenhouse gas emission per person so that it would not rise above a level acceptable in developed countries". The plan indicated development targets for the electricity system that would contribute to the reduction of greenhouse gas emissions.

The State Comptroller's Office found that the master plan formulated by the Ministry of Infrastructures did not provide solutions for the attainment of its strategic target mentioned above. The master plan did not determine a time period for achieving this goal or define the acceptable amounts of greenhouse gas emissions per person. Nor did it mention the extent to which means for developing the electricity system could contribute to the reduction of greenhouse gas emissions. As a result, the master plan does not lay a foundation for achieving its strategic target but only serves as a general statement.

In its reply to the State Comptroller's Office of August 2009, the Ministry of Infrastructures said that "the master plan for electricity production is part of the master plan on energy, the draft of which is still at the discussion stage … It is the Ministry's intention to update the master plan for energy to take the latest developments into account".

In updating the master plan for energy, the Ministry of Infrastructures must work out how it will attain its strategic target for greenhouse gas emissions, by drawing up a work schedule, determining the actions required and clarifying the goals.

In its annual work programs for 2008 and 2009 the Ministry of Infrastructures presented targets for expanding the use of renewable energy and conserving electricity. The attainment of these goals should reduce greenhouse gas emissions from the production of energy.

However, the work programs did not relate to the reduction of greenhouse gas emissions in energy production by spelling out reduction targets and concrete steps for reduction in accordance with a binding work schedule. Furthermore, the programs did not specify the contribution of targets in the fields of increased use of renewable energy and energy conservation to reducing greenhouse gas emissions.

In its reply to the State Comptroller's Office of August 2009, the Ministry of Infrastructures stated that "The Ministry of Infrastructures, which is responsible for the proper functioning of energy production, cannot set up development plans for electricity production with a view only to greenhouse gas emission reduction … A strong and continuous rise in electricity demand is forecast for Israel, as opposed to other countries, due to population growth and the development requirements of its economy … The plans of the Ministry to expand the utilization of renewable energy and to increase energy conservation do not enable us to reverse the trend towards an increased demand for electricity - but they can moderate the rate of increase. Accordingly, we are striving to reduce specific emissions of greenhouse gases by reducing pollutant emissions per unit of energy produced".

The State Comptroller's Office believes that in order to improve and increase the efficiency of the measures to be taken by Ministry of Infrastructures in the area of greenhouse gas emissions, it must include specific targets in its annual work programs and detail the means for attaining them in the framework of a defined schedule.

4. It should be emphasized that in 2008 the Government began to accelerate the process of increasing energy efficiency and introducing renewable energy: in March the Government decided[21] to set a target for reducing the use of electricity in the economy by 20% of the estimated consumption of electricity in 2020 on the basis of the electricity consumption of 2006, and in September the Government decided[22] to formulate steps to achieve this target, including increasing energy

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21 Cabinet Decision 3261, 13 March 2008.
22 Cabinet Decision 4095, 18 September 2008.

efficiency in government installations; financing projects for energy efficiency in local governments; formulating standards of energy efficiency in the economy; raising public awareness of the issue; assisting in obtaining credit for energy suppliers; and setting standards for energy-aware construction.

In August 2008 the Government decided[23] on a five-year plan for the period of 2008-2012 in which the government and private sources would cumulatively invest in research and technological development and the production of electricity by means of renewable energy. In January 2009 the Government decided[24] to set a target for producing electricity from renewable energy at a rate of 10% of the country's energy needs by 2020, with an interim target of 5% by 2014. The Government also decided to build a power stations based on renewable energy sources, particularly in the Negev Desert and the Arava Plains, which would produce no less than 250 megawatts every year from 2010 until 2020. In the course of 2009 the Government began implementing its decisions; among other things government ministries took steps to save energy, and tenders were published for the establishment of solar power stations in the Negev Desert.

Likewise, in 2008 and 2009, the Regulator of the Electricity Market in Israel (the Public Services Authority - Electricity) set rules for the operation of private electricity-producing installations based on various forms of renewable energy and set rates for the sale of the electricity produced by them to the national electricity network.

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23 Cabinet Decision 3954, 21 August 2008.
24 Cabinet Decision 4450, 29 January 2009.

The reduction of greenhouse gas emissions by various means, such as producing electricity using renewable energy, and reducing fuel combustion in transportation, has other advantages besides direct reduction of greenhouse gas emissions: for example, it leads to improvement in the quality of air, land, and water sources, thereby improving citizens' quality of life and their health and welfare. The technological developments required to implement the means for reducing greenhouse gas emissions generate business profit centers, increase technology exports, and speed economic development. Accordingly, although in the short run the reduction of greenhouse gas emissions involves increased costs to the economy, in the medium and long run it is not just an expense but also a form of investment, with the attendant advantages. It is thus worthwhile examining budget allocations for this from a comprehensive viewpoint while internalizing the savings made by reduction of the ecological damage caused by greenhouse gases.

Monitoring Greenhouse Gas Emissions

1. The Central Bureau of Statistics (hereafter - the Bureau) monitors greenhouse gas emissions at the national level. Since 2005 the Bureau has regularly been calculating the principal greenhouse gas emissions (calculations were made for the year 2003 and thereafter)[25]: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) and four gases defined as "gases of origin for greenhouse gases" - carbon monoxide (CO), nitrogen oxide (NO_X), microbial volatile organic compounds (MVOCs), and sulfur dioxide (SO_2). The data are published in the Bureau's Statistical Yearbook.

In order to calculate the emissions, the Bureau receives data on their sources, including energy-producing fuels, industrial production, cattle

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25 The foundations for the calculation of the main greenhouse gas emissions were laid by the Ministry of Environmental Protection: in the framework of studies commissioned from experts, calculations were made as to emissions in 1996 and 2000. The methodology for the calculations was worked out according to the professional guidelines of the IPCC. The Bureau has updated the methodology and continues to use it.

herds, motor vehicles, and waste deposits. Data is received from the relevant government ministries, local governments, and large industrial plants.

The authority of the Bureau to collect data is regulated by the Statistics Ordinance [New Version], 1972. However, according to the Ordinance, the Bureau may not publish any data it collects relating to non-state institutions which would enable those institutions to be identified, without their prior agreement. For this reason, in the Statistical Yearbook the Bureau aggregates data from several categories into one category, classified as "other sources". For the same reason, and because the country's oil refineries have been privatized, detailed data from the fuel refining sector on greenhouse gas emissions may not be published.

In the opinion of the State Comptroller's Office publication of detailed data can contribute significantly to the development of effective policies to reduce greenhouse gas emissions and effectively monitor them. Publication can put public pressure on the polluting bodies to take appropriate steps to reduce their greenhouse gas emissions. Accordingly, data publication should be arranged and presented at a level which is suitable for decision-makers and international bodies.

The Bureau calculates carbon dioxide absorption in forests according to raw data received from the Jewish National Fund, the body responsible for afforestation in Israel (these data were reported to the IPCC but do not appear in the Statistical Yearbook because of lack of space in the relevant table). In the year 2000 absorption reached 0.4 million tons of CO_2, while in 2005 it rose to 0.5 million tons. In addition, the Bureau is developing a model for calculating three more groups of greenhouse gases which are emitted in relatively small amounts but which have a considerable effect on warming - fluoro-carbons (PFCs), hydro-fluoro-carbons (HFCs), and sulfur hexafluorides (SF_6).

A large number of the countries obligated to reduce greenhouse gas emissions are members of the European Union (EU) and are subject to its regulations on greenhouse gases, including their monitoring. Directive 2003/87/CE of the EU relates to the monitoring principles demanded of European member states, which include monitoring by measurement or calculation of the emissions; calculation in accordance with the mathematical product of activity data, the coefficient of the emission, and

the coefficient of its carbon dioxide conversion; basing activity data (amount of fuel, level of production, etc.) on supply data or on measurement; calculating every greenhouse gas emission from installations (as defined in the Appendix to the Directive); recording identifying data, including the name of the installation, its address, and the activity conducted there (in accordance with the Appendix to the Directive, on the types and levels of activity requiring monitoring), and the identity of the owner (an individual or a firm) of the installation.

Israel is not obligated by the directives of the EU. Nevertheless, the monitoring activity carried out by Israel through the Central Bureau of Statistics accords with some of the demands of the EU Directive: emissions are calculated; the calculation meets the criteria defined in the Directive; and the calculation is made for the relevant sectors, types of fuel used, and main greenhouse gases. It should be noted that in 2008 the Bureau voluntarily submitted to the Secretariat of the Climate Convention a report on greenhouse gas emissions in 2000 and 2003-2005. The calculations were done in accordance with the guidelines of the IPCC and published on the website of the Climate Convention.

Nevertheless, the monitoring of greenhouse gas emissions is not regulated by law in Israel, or by regulations or ministry directives. The decision to calculate greenhouse gas emissions was an internal decision of the Central Bureau of Statistics, based on the authority granted it by the Statistical Ordinance to collect environmental data. As a supplementary step to this important initiative of the Bureau, the State Comptroller's Office believes that the monitoring of greenhouse gas emissions should be regulated officially - the body responsible for it, the methods to be used, the data necessary, and the level of detail required, in accordance with the types of greenhouse gases and the source emitting them. This arrangement will ensure that the monitoring system will confirm to the demands of the national plan for reducing greenhouse gas emissions.

2. In December 2007, the head of the environmental desk in the Bureau reported on his participation in the United Nations Climate Change Conference on Global Warning that took place in Bali, Indonesia. He noted that from the standpoint of the Bureau "in addition to the data collected today, new variables and indicators can be developed which will better

serve decision-makers as a basis for determining Israel's strategy for dealing with climate change". He specified the needs: improvement of data - broadening coverage also to gases emitted from cooling systems and better data-collecting on methane emanating from waste deposits; expanding data-collecting on existing projects to reduce emissions (Clean Development Mechanism (CDM) projects) as well as research and development in this area; expansion of statistical data on renewable energy and increasing energy efficiency in the electricity market, in industry, in transportation, in construction, and in private homes.

The examination indicates that some of the problems listed above by the head of the environmental desk in the Bureau have not yet been solved. The Bureau still has almost no statistical data on renewable energy and energy conservation. The analysis of such data would increase public awareness of the issues and enable the formulation of policies for dealing with them. Thus, the Bureau has almost no statistics on the reduction of greenhouse gas emissions as a result of CDM projects and the contribution of new technologies (for example, industrial automation) for greenhouse gas reduction that have been developed and which influence the greenhouse gas coefficients used by the Bureau in its calculations.

Summary

According to organizations which deal with the quality of the environment, one must take into account that the 21st century will probably be labeled the "green century". Any country that can get ahead with its arrangements for reducing greenhouse gas emissions will enjoy an accumulation of knowledge, technological breakthroughs, patent registrations, and the expansion of its exports. Furthermore, the international status of a country which does not make preparations for reducing greenhouse gas emissions is liable to suffer, to the point of being subjected to sanctions.

Accordingly, the State Comptroller's Office believes that the means for reducing greenhouse gas emissions should be examined, not only from the standpoint of providing an answer to formal obligations on greenhouse gas reduction, should they be imposed on Israel in the future, or from the standpoint of the direct budgetary costs involved, but also from the long-term social and economic benefits to be gained. Furthermore, in order to ensure the formation and implementation of effective policy for the reduction of greenhouse gas emission, both the network of observation and monitoring of climate change and the system of monitoring of greenhouse gas emissions must be developed and expanded.