D. MEXICO

Contents

1. INTRODUCTION

After outlining by way of introduction the energy production and consumption in Mexico, and following an evaluation of the potential for bioenergy in the country, this chapter describes the legal framework for bioenergy, including a detailed summary of the provisions of the Law on the Promotion and Development of Bioenergy and related legal instruments. It also includes an outline of the relevant international obligations binding upon Mexico. An overview of the Mexican policy related to bioenergy is followed by an assessment of the strengths and weaknesses of the legal framework in the subsequent sections. In conclusion, some recommendations for the enhancement of the Mexican legal framework related to bioenergy are formulated.

1.1 Energy consumption and production in Mexico

Mexico is an oil producing country, which renders oil the predominant energy source, with a contribution of about 50 percent since the 1960s. This figure has however decreased over the last decade. Carbon sources, on the other hand, are of limited significance and account for less than 10 percent of the gross domestic energy supply. This is due to that fact that there are few carbon deposits in the country, and these are found primarily in the North. This source of energy now represents 2 percent of the total domestic energy supply.[96] According to available data, oil became the predominant energy source towards the beginning of the 1980s, following a transition from traditional renewable sources such as wood fuel, while hydroenergy was replaced by thermoelectricity as the major source of electricity production.

Despite the fact that Mexico has some of the largest renewable energy resources in the world, it has not followed the global trend towards increasing their use. However, given the data from recent studies which reveal that the level of hydrocarbon reserves in the country will be depleted in less than ten years, the resultant increased price of fossil fuels may provide an opportunity for the commercial development of renewable energies.[97] The national oil company, *Petróleos Mexicanos* (PEMEX), currently imports 30 percent of the oil with which it supplies the national market. One should

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[96] SENR. 2007. *Balance Nacional de Energía*..

[97] Barbosa, F. 2006.

also note that Mexico is the second largest emitter of greenhouse gases (GHGs) in Latin America after Brazil.[98]

Although the use of renewable energy sources in Mexico increased in 2005 and 2006 – mainly in the forms of hydroenergy, geothermal and wind energy – it is well below its potential. Renewable energy represented only 3.5 percent of the gross national energy supply in 2006, as indicated in the 2006 National Energy Balance.[99] This figure compares with the 90 percent share of hydrocarbons in the gross national energy supply, which has decreased since 2005, when it represented 90.3 percent. Solar energy is the renewable energy source with the greatest potential in Mexico, as the country produces an average sunshine of 5 kWh/m2, which ranks among one of the highest in the world.[100]

As for firewood, various methodologies indicate that the figures presented in the 2006 National Energy Balance (5.8 percent of the total final energy consumption demand) are below actual consumption levels. This reflects the high importance of this source of energy in a developing country like Mexico, where rural and isolated communities meet the majority of their energy needs with firewood. It is estimated that 75 percent of the energy consumed in rural homes comes from this source.

Mexico currently produces approximately 45 million litres of bioethanol from sugarcane, but consumes 164 million litres that are mainly used as raw material by chemical and food industries.[101] It should also be noted that Mexico's total energy consumption increased by 3.3 percent in 2006 as compared with the 2005 consumption.

1.2 Energy policy

Mexico's industrial development policy until the early 1980s consisted of oil company expropriations and the subsidization of energy goods derived from oil. This resulted in the massive utilization of oil-based energy sources, in the majority of cases in inefficient processes and without sufficient attention paid to environmental impacts.

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98 WRI. 2005.
99 SENER. 2007. *Balance Nacional de Energía.*
100 Torres-Roldán, F. and Gómez Morales, E. 2006.
101 Masera, O. 2006.

A number of barriers to the development of renewable energies exist. Energy planning is based on methodologies that only evaluate the economic production cost on a short-term basis. Moreover, energy policies fail to take into account the benefits that renewable energies bring to the national economy, such as the stability of energy prices in the long term and the reduction of the risks in energy supply. Combined with the fact that the country disposes of important fossil fuel sources, this has meant that energy policies are still based on non-renewable sources of energy.[102]

Nevertheless, the country's energy policy is currently undergoing some transformation and the existing marginal contribution of renewable energy to the gross domestic energy supply is expected to increase over the period 2005–2014. The Secretary for Energy (*Secretaría de Energía* or SENER) is promoting, jointly with the Federal Electricity Commission (*Comisión Federal de Electricidad*) a number of projects in the area of hydroelectricity (2 254 MW), wind energy (592 MW) and geothermal energy (125 MW).

The government has recently made significant efforts to create a solid foundation for the transition to sustainable energy by removing the existing barriers to the development of renewable energy. The Climate Change Strategy of 25 May 2007 (*Estrategia Nacional de Cambio Climático*) identifies a number of GHG mitigation opportunities and sets the target of installing a capacity of 7 000 MW to generate 16 000 GWh per year from renewable energies (excluding large hydroprojects) by 2014. The Strategy also outlines some directions for future actions in the production and use of energy, including: establishing fiscal incentives to promote investments in sustainable energy projects; eliminating subsidies to the consumption and production of energy from fossil fuels; promoting the production of electricity from renewable sources; enhancing the private sector's participation in the production of low-intensity energy production, in particular from renewable energies; and supporting research in low energy intensity technologies, in particular renewable energies.[103]

Another significant step towards the creation of a legal framework for renewable energies was the adoption in February 2008 of the Law on the Promotion and Development of Bioenergy of 1 February 2008 (*Ley de Promocion y Desarrollo de los Bioenergeticos*).[104] The law aims at: helping Mexico's

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[102] Eguren, L. 2007.

[103] *Estrategia Nacional de Cambio Climático*, 25 May 2007, available at www.semarnat.gob.mx.

[104] *Ley de Promocion y Desarrollo de los Bioenergeticos,* 2008, available at www.disputados.gob.mx.

energy diversification and reducing its energy dependence; contributing to sustainable development; decreasing atmospheric pollution, as well as that of soils and aquifers; and promoting the economic development of rural populations.

In this context, the Secretary for Agriculture announced in December 2007 that by the end of 2012 Mexico would dedicate approximately 300 000 hectares to the cultivation of crops for biofuels production. It was also intended that the production of biofuels should reduce negative environmental impacts, achieve energy security and improve the living standards of families depending on the agribusiness sector.[105] Finally, if ethanol was produced on a larger scale, it could substitute the imports of methyl tertiary butyl ether (MTBE), with predicted savings of over US$ 100 million per year that are currently spent on importing this product.[106]

In addition to these government initiatives, it should be underscored that Mexican companies were among the first in the developing world to begin voluntarily preparing inventories of their GHG emissions according to the World Resources Institute's guidelines and as part of the voluntary GHG accounting and reporting programme of the Secretary of Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales* or SEMARNAT).

1.3 The potential for bioenergy in Mexico

With an average production of 44 million tonnes of sugarcane and 5 million tonnes of sugar per sugar cycle, Mexico is self-sufficient in sugarcane production. The sugarcane crop represents 13.5 percent of the value of the national agricultural production and 0.5 percent of the Gross Domestic Product (GDP). It directly generates 440 000 jobs equivalent to 1 percent of the national labour force.[107] In 2006, 97 petrajoules of energy was produced from sugarcane, which represents 0.9 percent of Mexico's total primary energy production.[108] The potential for electricity production from sugarcane is superior to 3 000 Gigawatt hours per year. However, because of the

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[105] Speech given in December 2007 by the Secretary of Agriculture, Cárdenas Jiménez.
[106] Ethanol is currently only used in the chemical industry, Torres-Roldán, F. & Gómez, Morales, E. 2006.
[107] *Tarde, pero México ya entró en la era de los bioenergéticos*, 2007.
[108] SENER. 2007.

sugarcane industry crisis, the annual production has not markedly increased since 1996, but oscillated at around 91 petrajoules. The sugarcane crisis is a consequence of the protectionist policies of some countries or trade groups, which has been intensified by the discovery of new substitutes to sugar (sweeteners). This crisis has been clearly reflected in the sustained fall in the selling price of sugar.[109]

Corn is the most important crop in Mexico, as 55.7 percent of the rural population is dependent on it for food and livelihood purposes. The 3.1 million corn producers represent 11.3 percent of the gross domestic production. The volume of the production exceeds 22 million tonnes annually. However, despite being the fourth largest corn producer in the world, Mexico does not produce any surplus of this cereal and imports it.[110]

Mexico also grows significant quantities of sweet sorghum, beetroot and yucca. For the production of biodiesel, the country could increase its existing production of palm oil, jatropha sunflower, canola, safflower and soy, and initiate production based on the Mexican pine nut or *Jatropha Curcas* which grows on marginal land and has a significant oil yield. Although this portrays quite a diversified range of production sources, it should be noted that the geographical distribution of the potential of crops for bioenergy production is varied. The central and southern Mexican States stand out for their agro-economic capacity to produce ethanol from sugarcane. The northern region meets the climatic, geographic and biodiversity conditions for the production of ethanol with sweet sorghum and tropical beetroot. As for the production of biodiesel, the humid tropical climate of states such as Veracruz, Chiapas, Tabasco and Campeche creates favourable agroclimatic conditions for the development of palm oil and jatropha plantations.

Another form of bioenergy that has a high potential in Mexico but that is as yet unused is solid municipal waste. A first inventory of this source from the landfills of the country's main cities presented in 1997 a potential of 202 petrajoules per year.[111] In 2006, it was estimated that in addition to the 73 million tonnes of agricultural and forestry waste with energy potential, the municipal solid waste of the ten largest cities in Mexico could generate 4 507 MWh/year of electricity.[112]

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[109] FAO. 2000.
[110] *Tarde, pero México ya entró en la era de los bioenergéticos*, 2007.
[111] SENER. 1997. *Balance Nacional de Energía.*
[112] Torres-Roldán, F. and Gómez Morales, E. 2006. p. 25.

1.4 Biofuel projects underway in Mexico

A number of projects to build plants for ethanol production are underway in the states of Sinaloa, Chiapas, Michoacán, Veracruz, Tamaulipas, Morelos, Jalisco and Monterrey.

In Sinaloa, a total of four ethanol plants are under construction. One of the plants is estimated to have an annual capacity to produce 15 million gallons of ethanol. A project launched by a Mexican sugar company is projected to generate 30 million gallons of ethanol and 100 000 megatonnes of dried distillers' grains. This project will consume 260 000 megatonnes of corn and sorghum. An investment of US$ 8 million is expected in the Jalisco in a project likely to generate 40 million gallons of ethanol and 120 000 megatonnes of dried distillers' grains.

Two plants of 10.8 MW located in Nuevo León use biogas through a process of internal combustion.[113] In Monterrey, 7 MW of electricity is generated from concentrated landfill biogas.[114]

A hybrid project was established in Hidalgo (natural gas, *combustoleo* and biogas) with a total capacity of 75 MW, of which 10.5 MW are generated using biogas.[115] In addition, a number of projects are pending and should materialize now that the Law on Bioenergy has entered into force.[116]

Thirty-three bioenergy projects have been registered under the Clean Development Mechanism (CDM). These include 28 methane recovery projects from animal manure and electricity generation projects, 5 projects converting landfill gas to energy and one project for the cogeneration of electricity and hot water using natural gas and biogas produced from on-site wastewater biodigesters.

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[113] SENER. 2003. *Balance Nacional de Energía*.

[114] *Tarde, pero México ya entró en la era de los bioenergéticos*, 2007.

[115] SENER. 2003. *Balance Nacional de Energía*; *Nuevas energías renovables: una alternativa energética sustentable para México, análisis y propuesta*, August 2004.

[116] Communication from the Lower House of the Mexican Parliament, Note No. 1487 *Proyectos para construir plantas industriales para la producción de bioenergéticos en ocho estados,* January 2008, available at www3.disputados.gob.mx; *Azucar Etico*, 7 June 2007, available at www.sucre-ethique.org.

2. LEGAL FRAMEWORK FOR BIOENERGY: NATIONAL LEGISLATION AND INTERNATIONAL OBLIGATIONS

This section includes a description of the Law on the Promotion and Development of Bioenergy and other laws that make up Mexico's legislative bioenergy framework, in addition to the relevant international obligations binding upon Mexico.

2.1 Law on the Promotion and Development of Bioenergy

2.1.1 Legislative history

In December 2005, two members of the Lower House of the Mexican Parliament introduced a bill on the promotion and development of bioenergy, which was approved by the House that same month. In February 2006, the bill was passed to the Senate for examination. In April 2007, after some amendments, the Upper House approved the bill, which was sent to the President for approval.[117]

In September 2007, an Executive veto of the draft law was exercised on several grounds. Firstly, it was considered that the proposal would not lead to the development of the bioenergy market because it focused excessively on agriculture and failed to promote and enhance the development of new technologies. The draft law was based on the production of bioenergy from a handful of crops, essentially corn and sugarcane, without promoting new production technologies, such as cellulose from forest biomass and the creation of ethanol from marine algae, bacteriological and enzymatic processes, among others. By concentrating on these two crops, the draft law was also considered to threaten the country's food security. Moreover, the draft law did not consider ways of harnessing the potential of biomass other than its transformation into liquid fuel. Furthermore, because of its focus on agriculture, the draft law did not distinguish between the production and consumption of bioenergy, which in turn impaired the development of the bioenergy market. When vetoing the draft law, the executive branch underlined the importance of regulating the energy side of bioenergy and the creation of synergies between the agricultural and energy economies.

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[117] *Proyecto de Ley de Promoción y Desarrollo de los Bioenergéticos* available at www.senado.gob.mx.

Further controversy surrounded the designation of the Secretary for Agriculture, Livestock, Rural Development, Fisheries and Food (*Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación* or SAGARPA) as implementing authority when energy matters generally fall within the domain of the Secretary for Energy (*Secretaría de Energía* or SENER). The draft law was also criticized for not envisaging the participation of other federal entities or small producers.

A final criticism was the executive's estimation that the transitional provisions of the Bill would create a surge in the demand of biofuels in a very short period of time as the programmes for the establishment of the minimum use of ethanol in gasoline were to be adopted within one year of the entry into force of the proposed legislation. This timeframe was criticised for not taking into account the capacity of the agricultural sector to undertake the necessary measures to secure the national supply of crops for the production of the required volumes of ethanol in such a short period. In addition, the bill limited the oxygenation of petrol to the metropolitan areas of the city of Mexico, Guadalajara and Monterrey, thereby excluding regions that, given their climatic characteristics and traditional crops, could successfully sustain the introduction of ethanol blended with petrol.

Following the Executive's veto, a second proposal was examined by the Lower House in September 2007, and approved by the Senate in December 2007. This second draft was then signed by the President and published in the *Official Journal* which came into force on 2 February 2008.

2.1.2 Overview of salient features

Objectives

In broad terms, the purpose of the Law on the Promotion and Development of Bioenergy of 1 February 2008 (*Ley de Promocion y Desarrollo de los Bioenergeticos;* hereinafter Bioenergy Law) is to encourage the development and promotion of bioenergy in order to diversify energy consumption in the country and achieve sustainable development by providing support to the agricultural sector. The law seeks to promote bioenergy production from agricultural, forest-based, algae, biotechnological and enzymatic processes without threatening national food sovereignty or security. The law plans to develop the production, distribution and effective use of bioenergy in order

to stimulate rural sector activities, generate employment and improve the quality of life of the population, especially that of marginalised communities. Article 1 of the law clearly demonstrates support for rural development and that of the less favoured rural communities. Also, one of the objectives of the law is to reduce polluting atmospheric emissions and GHGs by implementing the international mechanisms contained in treaties to which Mexico is a party. Finally, the law coordinates the actions of the federal government, the states, the Federal District and the municipalities, as well as the contributions of the private sector for the development of bioenergy.

Institutional framework

Chapter III of the Law details the institutional set-up by describing the roles of the various ministries responsible for its implementation as well as by clarifying the division of powers among federal, state and municipality government structures. The various ministries responsible for the implementation of the Bioenergy Law are: the Secretary of Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales* or SEMARNAT), which implements the environmental policy and ensures the protection of renewable and non-renewable natural resources (art. 13); the Secretary for Energy (SENER), which implements the national energy policy (art. 12); and in article 11, the Secretary for Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA), responsible for the general rural development policy (one of the objectives of which is to increase the living standards of rural families).

Other ministries and commissions that participate in the implementation of legislation to a lesser degree on bioenergy include: the Education Secretaries (*Secretarías de Educación*); the Secretary of Communications and Transport (*Secretaría de Comunicaciones y Transportes*); the Treasury and Public Credit Secretary (*Secretaría de Hacienda y Crédito Público*); the National Commission for Energy Saving (*Comisión Nacional para el Ahorro de Energía* or CONAE); and the Regulatory Energy Commission (*Comisión Reguladora de Energía*), which is tasked with capacity building, and exchanging energy between micro-scale systems and the electrical grid.

An Inter-secretarial Bioenergy Commission (*Comisión Intersecretarial de Bioenergéticos*) is created under article 8, which includes representatives from SEMARNAT, SAGARPA, SENER, the Secretary for Economy, and the Treasury and Public Credit Secretary (art. 8). Its functions include:

(i) monitoring the implementation of the law; (ii) participating in the drafting of programmes related to the production and marketing of crops, as well as the production, storage, transport, distribution, marketing and use of bioenergy; (iii) establishing the principles for the conclusion of agreements between the various levels of government; (iv) establishing the foundation for concurrent action of the private sector in implementing the law and related programmes and measures; (v) promoting agroindustries by, *inter alia*, advocating the necessary investments and the efficient use of technologies for the production and marketing of bioenergy; and (vi) evaluating various support programmes. With regards to the production and marketing of crops, the Bioenergy Commission is authorized to seek the opinion of the Inter-secretarial Commission for Sustainable Rural Development.

Environmental, social and economic aspects

The law does contain certain provisions on social or environmental aspects and is characteristic in its absence of market-based mechanisms as incentives for biofuels production and consumption. Title II, Chapter III of the law provides that SENER will establish the programme launching bioenergy into the energy framework, which includes the timeframe for the introduction of the oxygenation of petrol by blending with ethanol and biodiesel (art. 12). Although this programme is not designed to be legally binding, it will nevertheless contribute to the creation of a domestic market for biofuels.

The law incorporates some environmental protection provisions primarily seen by its explicit reference to Mexican environment-related legislation as well as international treaties to which it is a party. For example, provisions which stipulate that SEMARNAT will apply the regulations under the Law on Biosafety and Genetically Modified Organisms (GMOs) of 18 March 2005 (*Ley de Bioseguridad de Organismos Genéticamente Modificados*) in order to ensure that the activities regulated by the bioenergy law are compatible with the preservation, restoration and sustainable use of natural resources and biodiversity. SEMARNAT is also in charge of ensuring that no land use change from forest to agricultural land is carried out to cultivate biofuels crops. Lastly, SEMARNAT is responsible for evaluating the sustainability of programmes and activities based on the law and ensuring their respect of applicable environmental laws (art. 13). In addition, the law provides that SAGARPA and SENER will support scientific and technological research aimed at determining the necessary conditions for the production of bioenergy to be in harmony with the environment (art. 19).

SENER is to grant the permits required for carrying out activities and services related to the production, storage, transport, distribution and marketing of bioenergy. SENER is also to inform the Bioenergy Commission of details of the permits granted (art. 24).

The law provides that the ministries that comprise the Bioenergy Commission will elaborate on actions that serve social goals and enhance the sustainable production of (bioenergy) crops. It further states that these actions should drive productivity, favour job creation, and motivate the creation and mergers of rural companies, of which at least 30 percent of the shareholders should consist of the crops producers (art. 17). Also, the law provides that the SAGARPA will periodically evaluate the impact of the bioenergy programmes on food security, including by carrying out cost-benefit analyses, and shall further make this information available to the public (art. 11). This article also provides that permits for the production of bioenergy from corn will only be granted when surplus internal production exists.

The Bioenergy Law directs federal ministries, state governments and federal district government to promote the creation of infrastructure for bioenergy production. Incentives created under the framework of the law are directed towards those who contribute to the development of the bioenergy industry and the modernization of its infrastructure through the manufacturing, purchase, installation, operation or maintenance of machinery for bioenergy production. Those who carry out technological research directed to the reduction of polluting emissions to the atmosphere, water, soil, as well as technological innovation in the bioenergy production plants are also to be considered (art. 18).

Research and development

The law advocates research and development in the field of bioenergy. Article 19 stipulates that SAGARPA and SENER will support scientific research and technology development for bioenergy production and use, as well as training. Under article 12, SENER is required to incorporate into the bioenergy introduction new biofuels resulting from scientific research and development in this area (other than ethanol and biodiesel). The law also charges the Bioenergy Commission with the task of facilitating the promotion of scientific and technological research, as well as training in bioenergy (art. 20).

Sanctions

Article 25 on procedures, infringements and sanctions provides a list of offences that are subject to administrative and civil sanctions. Among the offences included in the act are: carrying out activities or services without permit, or infringing the terms and conditions indicated therein, or generally infringing other laws or regulations that would also apply to bioenergy. Infringements may lead to the imposition of fines, the withdrawal of permits and the partial, permanent or temporary closure of facilities (art. 26).

2.2 Broader legislative framework

In addition to the Bioenergy Law, a number of Mexican constitutional and legal provisions relate to bioenergy.

2.2.1 Constitution

The provisions of the February 1917 Constitution (*Constitución Política de los Estados Unidos Mexicanos*) relevant to bioenergy include:

- Article 2 on the rights of indigenous peoples and communities. It provides that indigenous peoples have the autonomy to preserve the integrity of their land. The cultivation of biofuels on indigenous land therefore would depend on the consent of the indigenous communities.

- Article 4 on the right to an adequate environment. The cultivation of GM crops or land use changes for the production of biofuels can potentially impact the right of every citizen to an adequate environment for his or her development and well-being.

- Article 25 on national sustainable development. It is the responsibility of the federal state to ensure that national development is sustainable and this includes bioenergy production and use. Bioenergy policies should not promote unsustainable practices that result in negative impacts on the environment, the economy or social development of the country.

- Article 27 on the right of the nation to restrict private property rights when necessitated by public interest, as well as the right to regulate the appropriation of natural resources in order to equitably distribute

public wealth. This empowers the government to take the necessary measures to establish the adequate use of land and to create reserves in order to preserve and restore ecological balance. The cultivation of biofuels and bioenergy programmes could be restricted on this basis.

2.2.2 General Law on Ecological Balance and Environment Protection

The General Law on Ecological Balance and Environment Protection of 28 January 1988 *(Ley General del Equilibrio Ecológico y la Protección al Ambiente)* adopts a sustainable development approach to environmental protection, and establishes the ways in which the right of every person to live in an adequate environment for his or her development, health and well-being can be guaranteed. The use of renewable natural resources must be carried out in a manner that ensures resource diversity and sustainability (art. 15). This would apply for example to the cultivation of GM crops for biofuel production, as these types of crops may threaten the biological diversity of certain grains.

The federal government and state authorities are tasked with designing, developing and applying economic incentives to encourage compliance with the objectives of the environmental policy within their respective jurisdictions (art. 21). The law urges the granting of tax incentives in favour of those who "conduct technology research leading to a reduction of pollutants" (art. 166). In addition, the law requires federal, state and local authorities to develop sound policies that include economic, financial, tax and market-based schemes that grant high priority to activities related to "the research and implementation of energy-saving mechanisms and the use of energy sources that reduce pollution" (art. 22*bis*). Under these provisions, if carried out in a manner that does not produce significant negative environmental impacts, bioenergy production activities would be prioritized to receive governmental incentives.

A preliminary environmental impact assessment is required, should the cultivation of crops or algae for biofuels production possibly threaten the preservation of any species or damage ecosystems. The authorization of SEMARNAT is required (art. 28). If algae are cultivated for biofuels production, production should be carried out in a manner that does not affect the ecological balance of the aquatic ecosystem (art. 88).

Certain provisions of the law specifically address soil protection (arts. 98 and 103): biofuels production should be compatible with natural use of the soil and not alter the ecosystem balance and should maintain the soils' physical integrity and productive capacity. Further, bioenergy crop cultivation must avoid practices that cause erosion, degradation or which adversely modify the topographical characteristics of the cultivated area (art. 98). In addition, cultivators of bioenergy crops should perform preservation, sustainable use, and restoration practices to avoid soil degradation and ecological imbalance and, where possible, enable their restoration (art. 103). In addition, SEMARNAT is to promote soil protection and restoration practices in agricultural activities, and shall carry out environmental impact assessment studies prior to granting authorizations for land use changes so that possible damage to the concerned area or any upset of its ecological balance can be anticipated (art. 104).

SEMARNAT could play a role in the promotion of ethanol consumption, as it has the power to promote before those in charge of the operation of polluting sources, the application of new technologies, with the aim of reducing their atmospheric emissions (art. 111).

Also, if solid municipal waste is used to generate bioenergy, SEMARNAT is empowered to promote the conclusion of coordination and counselling agreements with state and municipal governments for the identification of alternative reuse and final disposition of solid municipal waste, including the drawing up of their inventory and generating sources (art. 138).

2.2.3 Forest legislation

With regards to forests, there are two relevant laws: the General Law on Forest Life of 3 July 2000 (*Ley General de Vida Silvestre*) and the General Law on Sustainable Forestry Development of 25 February 2003 (*Ley General de Desarrollo Forestal y Sustentable*). The former addresses fauna and flora species that are under threat or rare and that have a special status. Their sustainable use requires a special permit and the establishment of Environmental Management Units. The latter regulates the forest industry and is not applicable to the species regulated by the General Law on Forest Life.

The General Law on Forest Life establishes the jurisdiction of the federal government, the governments of the states and municipalities, concerning forest conservation and sustainable use. The law also provides that the

objective of the national forest policy is to achieve forest conservation through protection and sustainable use, while maintaining and promoting the restoration of its diversity and integrity. As the use of forest waste to produce biofuels would be a sustainable forest use, through this law SEMARNAT could promote the participation of all people and sectors involved in the elaboration and application of measures for forest conservation and sustainable use (art. 15). In addition, SEMARNAT is empowered to encourage, in coordination with public education and other competent authorities, education and research institutions, as well as non-governmental organizations to develop environmental education programmes, professional training and scientific and technological research, to support forest conservation and sustainable use (art. 21).

The owners of forest lands have the right to use these resources sustainably and the obligation to contribute to the conservation of these habitats (art. 18). The authorities that are required to intervene in the activities related to the use of soils, water, and other natural resources for agricultural, pastoral, fishing, forestry and other purposes are directed by law to adopt the necessary measures for these activities to be carried out in a way that avoids, prevents, repairs, compensates or minimizes the negative effects they may have on forests (art. 19).

The General Law on Sustainable Forestry Development aims to regulate and promote the conservation, protection, restoration, production, cultivation, management and use of the forest ecosystems and forest resources. It also distributes the competence in forestry matters between the federal, state, the federal district and municipality governments, with a view to supporting sustainable forestry development. One of the specific objectives of the law is to consolidate the permanent forest areas, thus enhancing their sustainable management. This includes avoiding land use changes for agricultural purposes which affect forests' permanence and potential (art. 3). Any deforestation carried out for biofuels production would therefore contravene this law.

2.2.4 Law on the Sustainable Development of Sugarcane

Sugarcane is the only crop that is dealt with by means of a specific piece of legislation. The Law on the Sustainable Development of Sugarcane of 22 August 2005 (*Ley de Desarrollo Sustentable de la Caña de Azúcar*) creates the National Committee for the Sustainable Development of Sugarcane (*Comité*

Nacional para el Desarrollo Sustentable de la Caña de Azúcar) and the Permanent Board of Arbitration of the Sugarcane Industry and the Committees of Sugarcane production and quality (*Junta Permanente de Arbitraje de la Agroindustria de la Caña de Azúcar y los Comités de Producción y Calidad Cañera*). The provisions on product diversification provide that the Centre for Scientific and Technological Research of Sugar Cane (*Centro de Investigación Científica y Tecnológica de la Caña de Azúcar* or CICTCAÑA) will promote the exchange of proven high technologies on the use of agroenergy. It also states that the CICTCAÑA will propose to the National Committee, the carrying out of studies and projects on the development and use of agroenergy, in particular the use of ethanol in gasoline. In addition, the Special Commission for the Sugarcane Agroindustry is directed to seek alternatives to enhance the production of ethanol as a sub-product of sugarcane through a forum comprising Mexican and foreign business representatives in order to share ideas and formulate projects.[118]

2.2.5 Law on Biosafety

The Law on Biosafety of 18 March 2005 (*Ley de Bioseguridad de Organismos Genéticamente Modificados*) regulates activities involving genetically modified organisms (GMOs) in order to prevent, avoid or reduce the possible risks to human, animal, and plant health as well as to biological diversity. The objective of the law is to, *inter alia*, determine the geographical areas that should be free of GMOs or where activities using GMOs are restricted; and select the cultivations of which Mexico is the centre of origin, in particular corn, which will maintain a special protection regime (art. 2). Any bionergy crop production through GMOs is subject to this piece of legislation. The import or commercial release of GMOs requires a permit (art. 32). It is further specified that GMOs that are subject to authorisation include those that are destined for human consumption or use, including grains (art. 91).

2.2.6 Law on Sustainable Rural Development

The Law on Sustainable Rural Development of 7 December 2001 (*Ley de Desarrollo Rural Sustentable*) aims to promote the planning and organization of agricultural activities with the aim of improving the quality of life of rural population. The law establishes that sustainable rural development is of public interest and includes the planning and organization of agricultural

[118] Report of the activities of the Special Commission for the Sugarcane Agroindustry, 2007.

production, its industrialization and commercialization. Article 178 emphasizes the food security dimension of agriculture and highlights the needs of marginalized groups: "The state will establish the measures to provide the supply of food and basic and strategic products to the population, promoting their access to least favoured social groups and giving priority to national production." Article 179 specifies that the basic and strategic products include corn, sugarcane, and sorghum. Chapter V on rural capitalization, compensation and direct payments establishes subsidies for the agricultural sector.

2.2.7 Law on Rural Energy

The Law on Rural Energy of 30 December 2002 (*Ley de Energía para el Campo*) establishes subsidies for the energy consumption of the agricultural sector. The executive power is to establish a programme for the stimulation of energy directly used in agricultural activities through prices and tariffs (art. 4). It is further provided that these prices and tariffs should promote the productivity and development of agricultural activities (art. 5). The implementation of Mexico's Climate Change Strategy should lead to the elimination of these subsidies for fossil fuel-based energy used in agricultural activities.

2.2.8 Income Tax Law

The Income Tax Law of 1 January 2002 (*Ley del Impuesto Sobre la Renta*) applies to both companies and private individuals. On 1 December 2004, article 40, section XII, was modified to grant a rate of accelerated depreciation equal to 100 percent of the cost of investments made in machinery and equipment used for renewable energy. This incentive is only valid where the machinery and equipment depreciated at the rate of 100 percent is used at least for a five-year period. Where the machinery and equipment is not operational at least for this period, the taxpayer will be required to include the percentage deductions differential corresponding to the years in which the machinery was not in use and characterize this amount as taxable income.

2.2.9 Planning Law

SENER is responsible for drafting annual sectoral programmes for the production, storage, transport, distribution, marketing and efficient use of

bioenergy within the framework of the Planning Law of 5 January 1983 (*Ley de Planeación*). This law contains specific provisions to ensure the public participation of organizations representing, *inter alia*, workers, farmers, academic and research institutions, business groups and indigenous peoples (arts. 20 and 20*bis*).

2.4 Related institutional mechanisms

Several inter-institutional coordination mechanisms exist that were created outside the bioenergy framework that are nevertheless relevant to the bioenergy sector. These include the Inter-secretarial Commission for Sustainable Rural Development; the Energy Sector Committee on Climate Change; and the Consultative Council for the Enhancement of Renewable Energy. Below is a brief description of these mechanisms and their functions.

The Inter-secretarial Commission for Sustainable Rural Development *(Comisión Intersecretarial para el Desarollo Rural Sustentable)*, established under article 10 of the Law on Sustainable Rural Development of 2001, is responsible for programmes at the national, regional and local levels to manage corn and sugarcane plantations for ethanol production, as well as oilseeds for biodiesel production. The Commission includes representatives from SENER, PEMEX (the Mexican national oil company) and the Federal Electricity Commission. The tasks of the Commission include the setting of the national strategy for bioenergy development and the decentralization of programmes, resources and functions.

The Energy Sector Committee on Climate Change (*Comité de Cambio Climático del Sector Energía*) is designed as the coordination mechanism together with SEMARNAT for the follow up, analysis and definition of policies and activities related to climate change and the CDM in the energy sector in Mexico. Its permanent members include SENER, PEMEX, the National Commission for Energy Saving and the Fund for Energy Saving (*Fideicomiso para el Ahorro de Energía*). Invited members include representatives of governmental institutions, the private sector, non-governmental organizations, and state governments.

A National System of Research and Technology Transfer for Sustainable Rural Development, created under the Law on Sustainable Rural Development of 7 December 2001 (*Ley de Desarrollo Rural Sustentable*), is in

charge of coordinating scientific research and technology related to crops, as well as the development, innovation and technology transfer required in the sector (art. 21). Furthermore, this body is in charge of coordinating the proposals received from academic institutions, universities and producers' organizations under the National Programme on Scientific Research and Technology in Crops for Bioenergy. Further, it is responsible for promoting and coordinating the participation and liaison of research centres, universities and superior education institutions with the productive sector for the development and execution of research projects in the field of bioenergy (art. 21).

The National Association of Solar Energy and the National Commission for Energy Saving run a Consultative Council for the Enhancement of Renewable Energy, which includes representatives of both the public and the private sectors.

2.5 International obligations

Mexico is party to the United Nations Framework Convention on Climate Change (UNFCCC) (signed on 13 June 1992 and ratified on 11 March 1993); the Kyoto Protocol (signed on 9 June 1998 and on 7 September 2000); the Convention on Biological Diversity (signed on 13 June 1992 and ratified on 11 March 1993) and the United Nations Convention to Combat Desertification (signed on 15 October 1994 and ratified on 3 April 1995). Mexico has also been a member of the World Trade Organization (WTO) since 1995.

2.5.1 North American Free Trade Agreement

Mexico is a party to the North American Free Trade Agreement (NAFTA) of December 1992, which came into effect in 1994. The agreement initially eliminated a majority of tariffs on products traded among Canada, the United States of America (hereinafter US) and Mexico, and gradually phased out the remaining tariffs over a ten-year period. The agreement is trilateral in nature in all areas except agriculture, where tariff reduction phase-out periods and protection of selected industries were negotiated on a bilateral basis. No exception was made concerning the removal of tariffs on agricultural products in Mexico's bilateral agreement with the US, while the Canadian agreement excluded poultry meat, dairy products and sugar. The removal of tariffs in 2008 implies that in the sugar sector, Mexico is currently

the only country in the world with a tariff- and quota-free access to the US market, which represents a great exporting opportunity.

The Special Commission for the Sugarcane Agroindustry (*Comisión Especial para la Agroindustria Azucarera*) established in December 2006 is in charge of monitoring: compliance with NAFTA's Chapter on Agriculture, the right of Mexico to export its entire sugar production surplus to the US as of 2008, and the price of sugarcane on the international market.

2.5.2 UN Framework Convention on Climate Change and the Kyoto Protocol

Mexico's Designated National Authority for the CDM under the Kyoto Protocol is the Inter-ministerial Commission on Climate Change (*Comisión Intersecretarial de Cambio Climático*), which was created on 25 April 2005.[119] The Commission is composed of representatives from SEMARNAT (Secretary of Environment and Natural Resources), SAGARPA (Secretary for Agriculture, Livestock, Rural Development, Fisheries and Food), SENER (Secretary for Energy), the Ministry for Communications and Transport, the Ministry for Social Development, the Economy Ministry, and the Ministry for Foreign Affairs.

The Mexican Committee for Emissions Reduction and GHG Capture Projects (*Comité Mexicano para Proyectos de Reducción de Emisiones y de Captura de Gases de Efecto Invernadero*) is one of the Inter-ministerial Commission's working groups. The Committee is composed of representatives from the same ministries as the Inter-ministerial Commission on Climate Change, except for the Ministry for Foreign Affairs, which does not participate in its work. The Committee aims to identify opportunities, facilitate, promote, evaluate and accordingly approve CDM projects. It is also in charge of sending the letters of approval of voluntary participation of those involved in CDM projects and their contribution to sustainable development in Mexico.[120]

In Mexico, there are no national CDM guidelines. However, a new baseline and monitoring methodology (Baseline methodology for production of

[119] For more information see www.semarnat.gob.mx.
[120] Agreement on the creation of the Mexican Committee for Emissions Reduction and GHG Capture Projects, 2004.

starch-based anhydrous bio-ethanol from cultivating renewable biomass for transport using a life-cycle analysis) have been submitted as part of a fuel ethanol project to the CDM Executive Board for its review.[121] One should note that the proposed methodology includes the condition that the use of anhydrous bio-ethanol fuel in transportation cannot be effectively enforced in the relevant national market.

Twenty-nine CDM-registered bioenergy projects are underway in Mexico. In addition, a large number of registered Mexican CDM project activities are methane-capture projects that do not include the generation of electricity but involve methane gas flaring (used for burning off unwanted gas or flammable gas and liquids through chimneys or vertical stacks). Under the Kyoto Protocol, carbon credits can be received for installing gas flaring towers for methane produced at landfills which prevent methane from reaching the atmosphere. The Law on the Public Service of Electric Energy of 22 December 1975 (*Ley del Servicio Público de Energía Eléctrica*) allows the generation of electricity by private persons only through a permit system in specific cases (art. 36). These provisions allow private individuals to produce and transmit electricity and oblige public electricity companies to buy it at the lowest price. As a result, the production of electricity from renewable energy is more expensive than from fossil fuels sources. This is unfortunate as the potential for electricity production from landfill gas and methane capture is significant. Estimates show that 73 million tonnes of agricultural and forest waste have energetic potential, and that the use of the municipal solid waste, from the country's ten main cities, for electricity generation could lead to the installation of 803 MW and generate 4 507 MWh per year.[122]

3. POLICY INSTRUMENTS RELEVANT TO BIOENERGY

3.1 National Development Plan (2007–2012)

The National Development Plan 2007–2012 of May 2007 (*Plan Nacional de Desarrollo 2007–2012*) establishes the national objectives, strategies and priorities that direct the government's actions under the current mandate. A number of strategies are relevant to the bioenergy sector. Strategy 15.14 calls for the enhancement of the use of renewable sources of energy and biofuel

[121] Destilmex fuel ethanol project, NM0253, available at www.cdm.unfccc.int.
[122] Torres-Roldán, F. and Gómez Morales, E. 2006.

through the elaboration of a legal framework and by promoting investments that drive the country's potential in this area. Also, Strategy 15.17 calls for the strengthening of the regulatory institutions relevant to the sector.

In addition, a number of objectives and strategies contained in the Plan relate to research and development in the bioenergy sector. Objective 13 asserts the need to generate scientific and technical information for the advancement of knowledge on priority environmental aspects to support decision making of the government, while facilitating informed public participation. Strategy 15.3 favours cooperation mechanisms for the execution of high-technology energy infrastructure projects, and promotes research and technological development projects that provide the best solutions to the challenges faced by the sector. Strategy 15.16 highlights the need to take advantage of research activities in the energy sector, to strengthen its research institutions, and to focus its programmes on, *inter alia*, renewable energy sources and energy efficiency.

3.2 Climate Change Strategy of 25 May 2007

The Climate Change Strategy of 25 May 2007 (*Estrategia Nacional de Cambio Climático*) reflects the Mexican Government's commitment to climate change mitigation and adaptation, and its recognition of climate change as one of the major challenges for the future. The Strategy identifies specific measures for mitigation and estimates of the potential of such measures for emissions reductions; the introduction of sustainably produced biofuels as one of the opportunities for GHG mitigation to 2014 is stated among the objectives. Furthermore, it proposes a set of research objectives as a tool to lay out precise mitigation targets. National requirements for capacity building for adaptation to climate change are also outlined.

The Strategy mentions the need to preserve Mexican agrobiodiversity through programmes jointly implemented by SEMARNAT and SAGARPA. Moreover, the priorities for research and knowledge creation for mitigation measures identified in the Strategy include technical, economic and environmental assessment of biofuels production and use, and the identification of opportunities for forest biofuels development. In addition, studies are proposed along several themes relevant to bioenergy: designing systems by which biomass can be used for hydrogen production; evaluating bioenergy potential; analysing the demand for final use of bioenergy and

related production chains; and technical, economical, social and environmental evaluations of ethanol production (from sugarcane) and its use.

The Strategy further sets a number of targets to be reached by 2012: the introduction of high-efficiency wood-burning stoves in rural communities (500 000 heaters, 45 petrajoules); the introduction of efficient ovens for organic carbon production (1 500 ovens); the gasification for electricity cogeneration (100 MW from sugarcane waste; 50 MW from forestry waste; 25 MW from municipal waste; and 33 MW from animal manure); and the production liquid combustibles (1 110 million litres of ethanol and 720 million litres of biodiesel).[123]

3.3 Agricultural and Fisheries Sectoral Programme 2007–2012 of 17 January 2008

The Agricultural and Fisheries Sectoral Programme 2007–2012 of 17 January 2008 (*Programmea Sectorial de Desarrollo Agropecuario y Pesquero 2007–2012*) was developed by SAGARPA, in accordance with the objectives outlined in the National Development Plan. The Programme outlines the national strategy in the area of bioenergy and calls for the adoption of a National Bioenergy Plan that would set the foundation for national production.[124] Objective 3 of the Programme consists of improving farmers' revenues by increasing Mexico's presence in international markets and by advocating value-adding processes and activities. In order to implement this objective, 300 000 hectares are to be allocated for bioenergy production by 2012.

Strategy 3.7 of the Programme on the promotion of the diversification of agricultural products and the integral use of biomass veers agricultural production towards bioenergy production in viable areas and crops and underlines the production, technology, marketing and use of biomass. This section cautions against the use of forestland for the cultivation of crops for bioenergy and instead advises sustainable use of the country's genetic resources. It calls for the technical and financial support necessary for the enhancement of production chains related to bioenergy. Finally, its seeks to promote productive technologies for crops that can produce biodiesel, such as sunflower and canola, as well as the production of ethanol from tropical forest species, forestry waste, beet, sugarcane, pineapple, etc.

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123 *Estrategia Nacional de Cambio Climático*, 25 May 2007, available at www.semarnat.gob.mx.
124 *Programmea Sectorial de Desarrollo Agropecuario y Pesquero 2007–2012*, 2008.

3.4 Voluntary markets and schemes

3.4.1 PEMEX's virtual emissions trading scheme

PEMEX, the Mexican national oil company, started its internal emissions permits trading scheme in Mexico in June 2001. Twenty-five business units of PEMEX participate in the scheme, namely: PEMEX's four Exploration and Production regions; PEMEX Refinery's six refineries; PEMEX Gas and Basic Petrochemistry's six gas processor installations; and PEMEX Petrochemistry's eight installations. The Environmental Protection Corporate Audit coordinates the development and operation of the market.[125]

3.4.2 SEMARNAT's voluntary GHG accounting and reporting programme

On 25 August 2004, SEMARNAT signed a memorandum of cooperation with the World Resources Institute and the World Business Council for Sustainable Development to initiate a voluntary accounting and reporting of GHG emissions programme.[126] This programme: provides tools to help companies calculate and report on their emissions; make available a reporting platform to register GHG emissions (the information provided by the companies is saved in a database coordinated by SEMARNAT); organizes information and training workshops to promote knowledge on the tools; and offers technical assistance in the preparation of GHG inventories and mitigation projects.

4. STRENGTHS AND WEAKNESSES OF THE LEGAL FRAMEWORK FOR BIOENERGY

4.1 Socio-economic and environmental guarantees

The Law on the Promotion and Development of Bioenergy contains clear links to other relevant legal instruments – in particular to those that create social and environmental guarantees related to bioenergy. The Bioenergy Law explicitly establishes that biofuels production should not threaten the country's food security and sovereignty, as defined in the Law on Sustainable

125 *Instituto Nacional de Ecología. Estudio de caso, PEMEX* available at www.ine.gob.mx.

126 For more information see www.semarnat.gob.mx.

Rural Development. In addition, it creates an obligation for the Secretary for Agriculture, Livestock, Rural Development, Fisheries and Food to periodically review and publicize the impacts of bioenergy programmes on food security and sovereignty. The law also refers to the development of least-favoured rural populations, in accordance with the Planning Law of 5 January 1983 (*Ley de Planeación*),[127] and the use of international instruments to reduce GHGs contained in international treaties to which Mexico is a party.

The Bioenergy Law specifies that in all aspects not covered explicitly by its provisions, the provisions contained in the following instruments will apply by default: the Law on Sustainable Rural Development; the General Law for Ecological Balance and Environment Protection; the General Law on Forestry Life; the General Law on Sustainable Forestry Development; the Planning Law and other laws and regulations applicable to the areas covered under the Bioenergy Law; the international conventions to which Mexico is a party (art. 5) and the Law on Biosafety (art. 13). In this way, the Bioenergy Law can be said to contain comprehensive environmental guarantees. Further, the application of the provisions on environmental impact assessments and biodiversity protection of the 1988 Law for Ecological Balance and Environment Protection, the application of the legislation on GMOs, and the protection of forest land and land use planning contained in the applicable forest legislation is noteworthy.

The allocation of mandates between the main ministries in charge of bioenergy is clear, and inter-institutional coordination is ensured by the Inter-secretarial Bioenergy Commission. The provisions of the Law on Bioenergy on research and training maximize resource efficiency by make use of the institution already established under the 2001 Law on Sustainable Rural Development, namely the National System of Research and Technology Transfer for Sustainable Rural Development.

Nevertheless, a potential conflict of laws may occur in relation to bioenergy production from waste. There is a lack of coordination between the legal regime of bioenergy crops that concerns agricultural aspects, and that of the generation of electricity from forestry, municipal or other kind of waste, which is regulated by the General Law on the Prevention and Management of Waste of 8 October 2003 (*Ley General para La Prevención y Gestión Integral de los Residuos*). The Bioenergy Law deals with both bioenergy generated by the

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[127] *Ley de Planeación*, *Diario Oficial de la Federación*, 5 January 1983.

sugar or oil content of a number of crops as well as that generated from the decomposition of biomass. On the other hand, one of the objectives of the General Law on the Prevention and Management of Waste is to value waste for its use in productive activities (art. 2). This law details the division of responsibilities between the federal government, the states, the federal districts and the local governments in the management and use of waste. As the Bioenergy Law confers power to SENER to grant the permits necessary for the production of all forms of bioenergy, in the case of bioenergy production from waste, this function could conflict with that of other federal or state authorities in charge of waste management and use under the waste management legislation.

The absence of legislation on the promotion of energy production from renewable sources may impede bioenergy projects. Until financial and fiscal incentives are created for companies and individuals to produce electricity from renewable energy, bioenergy projects from landfills and methane capture from animal manure will be unattractive and are unlikely to be developed.

The strongest criticism voiced against the Bioenergy Law is the absence of provisions to support a market for bioenergy in Mexico. The biofuel market is at a nascent stage in Mexico and the ability of this law to create strong market incentives will be key to its success. In this respect, the law draws a distinction between bioenergy production and consumption, and seeks the creation of synergy between the agricultural and energy economies. This addressed a flaw in preliminary drafts of the law which focused mainly on agriculture and did not adequately consider the energy sector. However, while the first draft law on bioenergy set a percentage of ethanol to oxygenate petrol in a number of metropolitan areas of the country, the law in its final version does not contain such specific language to this effect. It leaves to SENER the task of drafting a programme on the introduction of bioenergy for consumption, which is to include the timeframe for introducing the oxygenation of petrol using ethanol and biodiesel (art. 12). In this way, the law does not restrict the introduction of liquid biofuels to the metropolitan areas as did the draft law, although the language used by the Bioenergy Law does not provide a clear target of bioenergy for national consumption. The programme to be developed by SENER is a non-biding instrument that will guide the work of the various ministries in the area of bioenergy. Finally, the Bioenergy Law does not provide incentives to the private sector to innovate in products that make use of bioenergy, such as hybrid vehicles.

4.1.2 Food security and "ethanoinflation"

One of the objectives of the Bioenergy Law is the protection of food sovereignty and security. Mexico is not self-sufficient in corn production on which the Mexican diet is highly reliant. The country is reportedly already experiencing what has been referred to as "ethanoinflation," in other words, the increase in the price of corn due to the exponential growth in demand for this cereal in the US for ethanol production.[128] In 2007–2008, the price of corn doubled, reaching its highest value in ten years of USD$ 4.10 per bushel (one bushel is equivalent to 25.4 kg). Corn produced in the US represents about 40 percent of the global production of this cereal and 70 percent of the global exports by the US. The rising demand for corn in the US to produce ethanol could therefore lead to a global crisis that could affect Mexico significantly.

The first proposed draft law on bioenergy was criticised for threatening Mexico's food security as it focused excessively on corn and sugarcane, earned the popular accusation of "feeding cars rather than humans." The rise in biofuels demand will invariably drive the price of these food crops upward. In an attempt to address this criticism, the Bioenergy Law incorporated the caveat that corn may be used for bioenergy production only when a surplus exists. However, it should be underlined that as Mexico already imports corn from the US and China, and therefore its food security is not contingent upon on the existence of a national surplus, but rather on the fluctuations of the price of this cereal on the international market.

The Bioenergy Law promotes diversification of biofuel sources which should benefit the agricultural sector but without threatening the country's food security. The law contains stronger language on the promotion and development of research and training on bioenergy than the first draft law. These provisions will go a long way in augmenting the country's food security, as it is through research and technology that new uses of non-food products for the production of bioenergy will be discovered or promoted, such as has been the case with jatropha. Finally, cattle raisers may also benefit from biofuels production, as they will be offered a range of animal feeding products based on distillers dried grains, which are the by-products of ethanol production.

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[128] *Nace en México la "etanoinflación," El Pais*, 24 January 2007, available at www.elpais.com.

4.2 Challenges in enforcement

In light of the fact that the Bioenergy Law has entered into force very recently, an evaluation of its enforcement and effects on bioenergy industries is premature. Although the recent changes in Mexico's energy policy should create a favourable context for its application, one difficulty that may arise relates to the granting of permits for bioenergy production. As explained above, the Bioenergy Law establishes that SENER will grant permits to carry out activities and services related to the production, storage, transport, distribution and marketing of bioenergy. In the case of corn, it specifies that permits for bioenergy purposes will only be granted if there is a surplus in the national production. Apart from bioenergy from solid agricultural and forestry waste, and possibly from algae, biofuels production will be an agricultural activity, within the competence of SAGARPA. However, one should note that potential difficulties may be overcome by the fact that these permits will be granted in consultation with the Bioenergy Commission, where SAGARPA is represented.

Also, challenges created by inefficient administrative procedures mean that farmers have to wait for SENER's permission to sow, which is rather untenable in practice given restricted sowing periods. In addition, greater transparency in decision-making criteria for the grant of permits and related information is required when adopting the necessary regulations for the implementation of the Bioenergy Law .

4.3 Draft legislation on food security and renewable energy

Two draft laws relevant to bioenergy production are pending before the Mexican Parliament at the time of writing. Their prompt adoption and entry into force would translate the recent Mexican policy moves in support of renewable energy into a legally binding instrument and provide legislative support for food security objectives and activities.

The draft law on the use of renewable sources of energy (*Proyecto de Ley para el Aprovechamiento de las Fuentes Renovables de Energía* or LAFRE) was approved by the Lower House of Parliament in December 2005 and is awaiting Senate approval.[129] The draft law recognizes and values the benefits that can be derived from producing electricity from renewable sources of energy in the

[129] Draft law on the use of renewable sources of energy of 14 December 2005 (*Proyecto de Ley para el Aprovechamiento de las Fuentes Renovables de Energía*) available at: gaceta.diputados.gob.mx.

short and long-term. It establishes a number of financial incentives for the production of energy from renewable sources that are to be financed through various sources. A proposed fund for the use of renewable sources of energy (*Fideicomiso para el Aprovechamiento de las Fuentes Renovables de Energía*), funded by mandatory governmental contribution, is set up to help achieve a minimum target for electricity production from renewable sources of 8 percent the national supply by 2012 (excluding large hydro projects). One should note that the 2007 Climate Change Strategy seeks to amend this draft law to increase the percentage share of renewables in overall power generation.

A number of other funds are to be created within the fund for the use of renewable sources of energy. A green fund (*Fondo Verde*) will provide incentives for electricity production by Mexican individuals and companies that produce electricity from renewable sources for its sale to the electricity suppliers and connect with the National Electric System grid (art. 17). These incentives are designed to cover the cost differences between renewable energy production and energy based on conventional and less expensive sources. A fund for emerging technologies (*Fondo de Tecnologías Emergentes*) is to support the development of specific high-cost technologies for electricity generation in connection with the electrical grid (art. 18). A fund for rural electrification (*Fondo de Electrificación Rural*) will support projects that supply electricity from renewable sources to isolated and low-income communities. These projects can be isolated or connected to the grid (art. 19). The bioenergy fund (*Fondo de Biocombustibles*) is to provide incentives for marketing bioenergy in order to cover the difference, as estimated by SENER, between its production cost and its sale price (art. 22).

The draft law on the use of renewable sources of energy stipulates that during the first year of its operation, 7 percent of the resources of the Fund for the Use of Renewable Sources of Energy will be allocated to the Bioenergy Fund. In addition, the Programme on the Use of Renewable Sources of Energy to be developed by SENER is to set targets for the bioenergy content of petrol and diesel sold in the country. It is further provided that PEMEX will buy the necessary biofuels to comply with these targets and will incorporate the blended fuels in the whole country or in specific regions (art. 21). This last provision overlaps with the power granted to SENER under the bioenergy legislation to establish the programme on the introduction of bioenergy, which will include the blending of ethanol and biodiesel in for petrol. These provisions should go some way in addressing criticisms directed towards the Bioenergy Law that the absence of specific

targets and mandatory blending requirements leaves the law with an insufficient incentive structure for bioenergy production and consumption.

The draft law on planning for agricultural food and nutrition sovereignty and security (*Minuta de Ley de Planeacion para la Soberania y la Seguridad Agroalimentaria y Nutricional*) has been approved by the Lower House of Parliament on 30 March 2006 and is before the Senate at the time of writing.[130] It outlines the objectives of the federal policy for planning agricultural food and nutrition sovereignty and security. One of its aims are to exploit the productive potential of the country in a sustainable manner in order to reach, maintain and increase a positive food trade balance that is based on national production to ensure the nation's food security (art. 8(2)). It emphasizes the importance of strategic food products in the whole country to satisfy the population's basic needs (art. 8(7)). This draft law would essentially have the effect of giving preference to the cultivation of crops for food purposes over biofuels.

4.4 Private sector participation

The participation of the private sector in the implementation of a legal and policy framework for bioenergy should be enhanced, as the private sector is a key stakeholder in the creation of a dynamic green market. As announced in December 2007 by the Secretary for Agriculture, a Regulatory Council of Biofuels (*Consejo Regulador de los Biocombustibles*) would be created to enable the representation of all stakeholders, ranging from farmers to bodies responsible for monitoring land uses changes to those that analyse market dynamics.[131]

As highlighted in section 2.5.2, some legal limitations exist to the private sector's ability to participate in the energy sector, in particular in electricity production, and in order to increase the contribution of renewable energy to electricity generation that relate to the creation of a market for bioenergy. To this end, the proposed legislation on the use of renewable sources of energy discussed in section 4.3 contains a number of fiscal and economic instruments. The Bill on the Use of Renewable Sources of Energy is designed to stimulate the participation of private companies, non-governmental organizations, municipal governments and educational institutions in project financing and management.

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[130] Available at gaceta.diputados.gob.mx.

[131] *México, listo para convertirse en importante productor de biocombustibles*, 6 December 2007, Communication nº 271/07 of SAGARPA, available at www.sagarpa.gob.mx.

4.5 Promotion of CDM bioenergy projects

The additionality criterion under the CDM rules under the Kyoto Protocol (see section 1.2.1, Chapter 1) may lead to the postponement of governmental support of renewable energy so as not to alter the baseline scenario for CDM approval of the project. Currently, projects must show that they are not part of the existing baseline, and that they require the economic incentive of the CDM in order to materialize. As a consequence, projects that are either very profitable, do not face major barriers, or are part of national policy are very difficult to be approved under the CDM. Mexican-registered CDM projects have not received any public funding, although a proposed CDM fuel ethanol project recently received a significant amount of funding from the federal government. This amount is equivalent to 9 percent of the stocks of the company and will be delivered during the second operational year to corn and sorghum producers that supply the project with their products. It will be interesting to see if this government support will impede the project's registration under the CDM for failing to meet the additionality criterion.

The Bioenergy Law empowers federal ministries and state governments to provide public support to bioenergy projects; this could also impede their CDM registration, as the law envisages the granting of incentives for the manufacturing, purchase, installation, operation or maintenance of machinery for bioenergy production (art. 18). Similarly, if the Bill on the Use of Renewable Sources of Energy comes into force, the proposed allocation of public funds to bioenergy projects may constitute a barrier to the registration of these activities under the CDM.

4.6 Transport sector reform and promotion of ethanol use

In order to be effective and make the necessary transition towards renewable energy and greenhouse gas (GHG) mitigation, the Bioenergy Law should go hand in hand with a number of other governmental measures and incentives. One such priority could be improving air pollution in major metropolitan areas through improved public transport. The transport sector has the highest growth rate in energy demand in comparison with other consumer sectors, as well as the highest dependence on fossil fuels. The 2007 Climate Change Strategy includes the objectives of replacing cargo trucks and diesel buses over ten years of age as of 2008 and of increasing the coverage of rail cargo transport by 10 percent by 2014. If these objectives are translated into concrete actions, they should lead to significant steps towards GHG reduction.

Moreover, public authorities should be authorized to grant circulation permits to vehicles that include a certain percentage of ethanol in petrol. As noted in section 4.1, specific targets for the introduction of ethanol blended to petrol were included in the first version of the draft law but excluded from the Bioenergy Law . Instead, the law empowers SENER to formulate a programme for the introduction of bioenergy, which should include the timeframe for the introduction of the oxygenation of petrol with ethanol and biodiesel (art. 12).

Although air pollution regulation is already in place in the country, it has so far failed to significantly improve the air quality in Mexico's major cities. Mandatory requirements for the blending of ethanol with petrol would be an important step towards the reduction of emissions levels in the main metropolitan areas. In addition, ethanol is particularly beneficial when the automobile fleet is old, as is the case in Mexico.

5. CONCLUSION

Mexico has significant potential for bioenergy production and use but, as an oil producing country, it has yet to maximize its use and development of renewable energy sources. Nevertheless, the country's energy policy has undergone some recent changes, with the adoption of strategic instruments such as the 2007 Climate Change Strategy and the National Development Plan of 2007–2012. In addition, Mexico's Bioenergy Law, together with general environmental laws, provides environmental and social guarantees and adequate sanctions to ensure that the social and environmental exigencies are accounted for.

The Bioenergy Law does not contain, however, incentives for the creation of a market for bioenergy in Mexico, or specific immediate targets for the introduction of ethanol and biodiesel in the transport sector. In addition, until the Bill on the Use of Renewable Sources of Energy is passed, bioenergy projects involving methane capture from landfills and animal manure will remain economically unattractive and are unlikely to be developed. As the Mexican legal framework on bioenergy is either very recent or in the making, it thus remains to be seen how the new law will be implemented in practice, and whether the country's general framework on renewable energy will be consolidated.

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