

Case studies on bioenergy policy and law: options for sustainability



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PREFACE

Sound legal and regulatory frameworks for bioenergy are gaining increased importance as means to ensure that socio-economic and environmental sustainability considerations are taken into account in the production, promotion and use of bioenergy, with a view to minimizing risks of negative impacts and maximizing benefits in the immediate and long term. With regards to potential benefits, the primary policy drivers for bioenergy promotion have been recognised as energy security and self-sufficiency, although the contribution of liquid biofuels to meet transport and energy needs is limited. Many countries are also looking to bioenergy as a mechanism for climate change mitigation, both as a way to reduce the consumption of fossil fuels and also to emit reduced greenhouse gases from the use of liquid biofuels. Other countries, developing ones in particular, may benefit from the increased demand in bioenergy-related agricultural commodities to revive agricultural trade and stimulate agricultural and rural development. Other potential benefits include: the restoration of degraded lands; reduced land abandonment; increased income-base for farmers and forest owners; and improved employment opportunities in rural areas.

These opportunities should be addressed alongside the risks associated with bioenergy. The increased competition over agricultural crops for bioenergy purposes instead of food production has been highlighted as a concern for food security. Competition over the use of land and water resources for bioenergy production and for agricultural purposes augments pressures on these resources at a time where global water reserves are dwindling and potentially greater effect are feared on indigenous and local communities and small-holder farmers. In addition, evidence favouring the use of bioenergy as a way to reduce carbon dioxide emissions from burning fossil fuels is not conclusive, whereas the clearing of forests for agricultural purposes and bioenergy production presents a significantly higher contribution to greenhouse gases emissions into the atmosphere. Other risks include the loss, fragmentation and degradation of valuable habitats (such as natural and semi-natural forests, grasslands, wetlands and peatlands, and other carbon sinks), the loss of essential ecosystem services and increases in greenhouse gas emissions as a result of these changes. Further negative effects may also

be seen in the increased application of fertilizers and pesticides; increased water pollution and eutrophication; soil degradation and erosion; uncontrolled cultivation; introduction and spread of genetically modified organisms or of invasive alien species; and emissions from burning biomass and its adverse effects on human health.

This study builds on the preliminary findings of Legislative Study No. 95 on *Recent trends in the law and policy of bioenergy production, promotion and use* which sought to stimulate discussion on the features of national legal and policy frameworks for bioenergy in Latin America, Asia and Africa. The study concluded that in order to assess national legal frameworks for bioenergy and identify their strengths, weaknesses, gaps and overlaps, it is necessary to map out the existing regulatory structure as a whole, by reviewing policy, legal and institutional frameworks in a variety of relevant sectors, including the environment, forestry, water management, land and trade to name a few. Legislators and policy-makers should thus take into account a range of views that arise from different sectors through an interdisciplinary approach to designing the regulatory features of any bioenergy programme.

Maximizing the advantages offered by bioenergy while minimising the risks therefore depends on the existence of an enabling institutional and regulatory environment based on well-informed holistic policies. The aim of this study is to deepen the understanding of the interconnection of legislation on bioenergy with a number of other sectors. A narrow focus exclusively on bioenergy alone will prove insufficient to provide a solid regulatory basis that is fundamental to the sustainable development of the sector. To this end, this study examines bioenergy and bioenergy-related legislation, policy and institutions in selected countries in Latin America, Asia and Africa, namely: Argentina, Brazil, Estonia, Mexico, Tanzania, Thailand and the Philippines. The aim of this in-depth review is to identify legal tools that can significantly contribute to the economic, social and environmental sustainability of bioenergy production.

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1. INTRODUCTION

Discourse on potential opportunities and risks has increasingly propelled bioenergy high onto the legislative and policy-making agendas of governments around the world. At a time of rising fossil fuel and food prices, and ever-increasing international attention on climate change mitigation, the production and use of bioenergy has been analysed against its potential economic, social and environmental implications. The nature of bioenergy production and consumption brings together the agricultural and energy sectors; both impact (and are affected by) laws and policies on forestry, biodiversity and the environment, rural development, food security, trade, land management and land-use planning, and labour. Although perspectives vary significantly on the interactions between bioenergy and each of these areas, integrated policy action (through programmes or laws) is increasingly recognized as an essential element to ensure long-term sustainability of biofuel production vis-à-vis food security goals, agricultural and rural development and environmental sustainability. Through case studies focusing on Argentina, Brazil, Estonia, Mexico, Tanzania, Thailand and the Philippines, this publication is designed to canvass national legal frameworks across the different sectors relevant to bioenergy and to identify opportunities and challenges for effective linkages.

A bulk of the literature on bioenergy has initially focused on energy generation from liquid biofuels for transport derived from agricultural crops, the two most prevalent being ethanol and biodiesel. Biodiesel feedstock options are rapeseed and soybean. These are the so-called 'first generation biofuels'. Controversies regarding threats to food security stem from the fact that the feedstock used for the production of ethanol is largely food crops – sugar cane, maize, wheat and cassava. The recent rise in food prices has been arguably attributed to an increased demand for biofuel feedstock. With world food demand expected to almost double by 2050, the use of agricultural crops for non-food purposes such as bioenergy production is expected to have even more significant impacts on food insecurity. The situation is exacerbated by the role of climate change in producing extreme weather events, which may further negatively impact on food production. The range of incentives or subsidies offered for biofuel production will also impact land use patterns and likely increase competition for land. This may further marginalize poor or vulnerable segments of the population from access to natural resources needed for their livelihoods. Owing to favourable agro-climatic

conditions in Africa, Asia and Latin America, and the proliferation of south-south cooperation programmes these regions are likely to see a surge in bioenergy-related projects and the concomitant challenges for food security, land tenure, land management and land use planning, water availability and rural development will also increase.

Bioenergy sources are not only food crops, as indicated above; palm oil and jatropha are also increasingly used feedstock. 'Agrofuel' refers to products of agriculture biomass, by-products at farming level and industrial processing of raw material (agroindustries). Municipal by-products are produced by the urban population and comprise solid, liquid and gaseous biomass by-products. 'Woodfuel' is derived from forests, shrubs and other trees, or from wood processing activities. These are the so-called 'second generation' biofuels that are emerging as alternatives to 'first generation' biofuels (ethanol and biodiesel). These new fuels seem more promising in terms of reduced greenhouse gas emissions and reduced pressure on the natural resource base. The conversion technology is expensive, however, even though the cost of the cellulosic feedstock is much lower than for first-generation feedstock. Most policies and legislation thus currently tend to focus mostly on first generation biofuels, as second generation biofuels are not yet commercially viable.

In order to harness the full potential of bioenergy, its production and use have to be managed in a manner that takes into consideration the economic, social and environmental aspects of sustainability. Economic considerations mainly address whether production is commercially viable and profitable. In addition, policies and legislation that endorse or provide incentives for systems or products that have reduced environmental impacts or that incorporate social benefits can also advance economic sustainability. The implications for food security are one of the essential social dimensions of bioenergy strategies. Other social aspects include rural development that takes into account poor or vulnerable groups, employment and income generation, equitable access to land and other natural resources, and fair labour conditions. Stimulating bioenergy development through adequately structured law and policy can potentially provide additional income and employment for small-holders and other agricultural producers. Environmental sustainability requirements entail reducing harmful impacts on land and water resources, biodiversity and the climate. There is also the need to

prevent and mitigate negative environmental impacts throughout the biofuel production chain: mostly during feedstock production (agricultural cultivation) but also during the conversion process as well as use.

Legislative Study No. 95 on *Recent trends in the law and policy of bioenergy production, promotion and use* demonstrated that provisions on bioenergy production, promotion and use that could typically be contained in a law are instead often spelt out in policy and other strategy documents. These might cover issues such as designating the agencies responsible for regulatory oversight and their specific mandate. Another trend is that typical bioenergy legislation is much more specific and detailed than other types of legislation, as it includes specifications on blending and other technical quality standards. This peculiar complexity of bioenergy legislation explains why policy-makers should clearly understand what tools are available to intervene in the sector, and the relative efficiency of each of these tools (namely, policies, legislation or, as is usually the case, a mix of both). The choice of the type of instruments to use in regulating the bioenergy sector is usually informed by the sector's relative importance to the overall energy security of the country, the level of technological advancement and how organized or influential the players in the sector are.

Countries are at varying stages of bioenergy policy and legislative activity, ranging from those with no official policy on bioenergy to those that have developed their bioenergy policies over a number of decades, and thus have various legal instruments exclusively regulating different aspects of bioenergy. Geographic trends in policy and legislative activity can also be distilled – many Latin American countries are pushing forward with laws and policies that address bioenergy production and use, led by Brazil's pioneer biodiesel programs which started in the 1970s and have evolved over time. Asian countries have also been active, more recently, in formulating policies on renewable energy and bioenergy, and some such as the Philippines have translated this into legislative action. African states, in turn, have the fewest official policy documents on bioenergy in general, although several countries are forging ahead with concrete programmes and biofuels production targets. Mozambique is one of the legislative pioneers in Africa with a national biofuels directive passed in 2009, which includes mandatory blending requirements and creates a National Biofuels Council to coordinate policy and strategy.

Another example is South Africa whose Biofuels Strategy proposes to make biofuels contribute 2 percent of the total fuel supply by 2011 and is currently drafting a law regulating bioenergy.

The countries selected for the case studies have been chosen with a view to ensure broad geographic representation and to demonstrate the range of approaches to promoting and regulating bioenergy through diverse legal and policy solutions. Each of the case studies contains a comprehensive review of the country's legal framework for bioenergy. In addition to special legislation on some aspects of bioenergy and other renewable energy sources, each of the national case studies assesses a host of other laws and regulations, including legislation applicable to agriculture, water management, land management and land-use planning, environmental protection, forestry, labour, international trade and investment.

2. METHODOLOGY AND OVERVIEW OF CASE STUDIES

The seven case studies included in the next chapter engage in a comprehensive review of the national legal frameworks for bioenergy in selected countries. Some of the key questions addressed in the reviews are:

- Have adequate legal arrangements been made to back government policies and targets for renewable energy and bioenergy?
- Are appropriate market regulations and incentives in place to boost production and consumption of bioenergy?
- Have legislative measures been taken to ensure that the cultivation of energy crops to produce biofuels does not have adverse impacts on food security?
- Are questions concerning competing land uses and their social and environmental implications adequately addressed?
- How is bioenergy legislation related to the legal framework applicable to deforestation, protection of biodiversity, greenhouse gas emissions and introduction of alien species into the natural environment?
- Are appropriate procedures in place for assessing environmental impacts of bioenergy projects and ensuring stakeholder participation?
- Is the national institutional framework adequate and are there appropriate mechanisms for inter-institutional coordination?

The relevance of each question depends, naturally, on the specific circumstances of each country. To provide the reader with the necessary background information, the case studies describe the factual situation relating to the production, consumption and further potential of bioenergy in each country and review various national policy instruments relevant for bioenergy.

The Argentina case study elucidates the country's potential for bioenergy development by looking at the benefits of its agricultural industry as set against its domestic energy market. Argentina's legislative framework for biofuels focuses on domestic consumption, and sets out a rather complex regime to promote the construction of new facilities to supply the domestic market with biofuels. Three main mechanisms are established for domestic biofuel promotion: a 5 percent mandatory biofuel blending requirement with gasoline and diesel as from 2010, fiscal incentives for plants producing biofuels for the domestic market, and a price for biofuels set by the Argentine Government. The country is also looking to supply international markets with biodiesel, independent of the regime designed to supply the domestic market. The government has thus put in place a tax differential benefiting biodiesel exports by 27 percentage points in order to promote exports, (biodiesel had an *ad valorem* export tax rate of 5 percent compared with one of 32 percent for its alternative export product, soybean oil). The biofuels legal regime contains a definition of biofuels and a clear distribution of competencies among government agencies. It does however also entail complex administrative procedures and grants wide discretion to the implementing agency in determining the recipients of fiscal benefits. No provisions are made for credit opportunities or technical support for small and medium-sized enterprises. The government has proven to be keen on preventing fuel prices and agricultural exports from impacting on domestic food and energy prices (through the use of export taxes).

Brazil's biofuels program is currently hailed as one of the most advanced in the world, following thirty years of government initiatives and support. This is evidenced by the mandatory blending requirement set at a high 25 percent for bioethanol in gasoline and 4 percent for biodiesel in diesel. The bioenergy plan in place focuses primarily on bioethanol and biodiesel, but also includes research and development plans to improve planted energy forests (for charcoal), and agriculture and forestry residues (including sugarcane bagasse) for the co-production of energy. Given the

longer legislative history of the bioenergy industry in Brazil as compared with other countries under review, the Brazil case study focuses primarily on federal legislation promoting bioethanol and biodiesel before looking at laws and policies related to bioenergy.

Other market instruments used to promote bioenergy production and use include tax exemptions for biofuels and sales tax reductions for flex-fuel automobiles which represent more than 80 percent of market sales in 2009. The government is also taking steps towards augmenting the social and environmental sustainability of its plans to increase production areas for sugarcane and soybean, through programmes which benefit family-based agriculture as well as through zoning restrictions which prevent the planting of biofuel crops in vulnerable ecosystems and areas where food crops are grown. Some of the recent zoning initiatives include economic-ecological zoning strategies (known as ZEEs) and land-planning strategies that reward compliance with zoning requirements. The National Biodiesel Program (PNPB) has the stated goal of increasing domestic production and consumption of biodiesel while decreasing socio-economic inequality within and between regions. To this end, the first government-led certification scheme for biofuels – the Social Fuel Seal (*Selo Combustível Social*) – has been introduced, which ties tax incentives, federal credit and government-led procurement of biodiesel to the fulfillment of requirements which promote regional development by integrating smallholders into the biodiesel production chain. The Social Fuel Seal is essentially a reward for biodiesel producers who procure a percentage of primary crops from family-based agriculture.

Estonia has developed a rather elaborate legal framework applicable to bioenergy in line with the renewable energy and climate change policies of the European Union, such as EC Directive 2003/30 on the promotion of the use of biofuels or other renewable fuels for transport and EC Directive 2003/87 establishing a scheme for greenhouse gas emission allowance trading within the Community. Both these instruments have been recently superseded and require further updates to the Estonian legislative and policy framework. Incentives are created through several laws to increase the viability of biofuel development. Estonia's Alcohol, Tobacco and Fuel Excise Duty Act (2003) enhances the economic attractiveness of biofuels, by exempting the latter from the fuel excise duty. The Long-term Development Plan for the Fuel and Energy Sector 2002–2015 establishes a target to increase the share of renewable energy

sources to 5.1 percent of the total energy consumption by 2010. In order to promote the use of bioenergy and other renewable energy sources, the Electricity Market Act (2003) contains incentives for electricity production from renewable sources as well as the co-generation of heat and power. Article 19 of the Environmental Charges Act (2005) exempts biomass from the pollution charge for carbon dioxide emissions. Estonia participates in the EU's Emissions Trading Scheme (ETS), which sets a price for carbon dioxide emissions, thereby increasing the economic attractiveness of bioenergy in comparison to fossil fuels. The rules for implementing the EU ETS are contained in Estonia's Ambient Air Protection Act (2004). Estonia can also participate in Joint Implementation (JI) and emission trading under Articles 6 and 17 of the Kyoto Protocol, and is currently hosting four JI projects using bioenergy.

Until recently, no legislation dealing specifically with bioenergy existed in Mexico. This gap was filled in February 2008, when the Law on the Promotion and Development of Bioenergy came into force. The law aims to diversify the energy consumption of the country and achieve sustainable development. It outlines the responsibilities of the various federal ministries, as well as the states and municipalities in the elaboration of the policy in the area of bioenergy. Although the recent bioenergy legislation contains clear references to other pieces of legislation and includes social and environmental guarantees, its future enforcement and success may be contingent on factors such as having a well-functioning permit system. Mexico's energy policy is currently undergoing some transformation and the marginal contribution of renewable energy to the gross domestic energy supply is expected to increase. The Mexican Government has recently made significant efforts to establish the bases for a sustainable energy transition and adopted a number of strategic instruments to that end, including the 2007 Climate Change Strategy and the National Development Plan 2007–2012.

As a long-term energy strategy, the Philippines is exploring and developing renewable energy sources. Biomass, hydro, solar and wind are estimated to remain the largest contributors to the total share of renewable energy in the energy mix, with an average share of 27.5 percent. Meanwhile, hydrothermal and geothermal power will continue to be significant sources of electric power in the future. The Biofuels Act was passed in January 2007 to support the Philippine program on energy security. It was designed to strike a balance between maximizing the

benefits of locally produced bioenergy for energy security and mitigating the negative impacts on environment and food production. It sets up an institutional mechanism that considers the interests of all stakeholders. Specifically, it requires oil companies to blend biofuels in gasoline and diesel for use in the transport sector. The National Biofuels Board is tasked with specifying policies and priorities through the Biofuels Programme. Recent policy pronouncements indicate however, that the government may reduce its emphasis on biofuels, which primarily refer to biodiesel and bioethanol blends, as a major energy development strategy, as it faces challenges relating to costs of production and unanticipated impacts.

A striking feature of the Tanzanian energy matrix is the 90 percent contribution of biomass as the primary energy source. However, unlike the other countries selected for review, Tanzania does not have framework legislation and policy specifically dealing with bioenergy. Notwithstanding, the Petroleum Supply Act (2008) brings biofuels within its legal remit making provisions for the import, export, transport, storage, wholesale and retail trade of biofuels. Furthermore, several laws and policies indirectly address issues relevant to bioenergy, such as policies on renewable energy in general, forestry and environmental protection laws (which govern access to and management of natural resources such as agricultural land and forest areas), and trade, labour and food security legislation. Although the primary focus of these instruments is not bioenergy, the rules contained therein may be sufficient to create an enabling environment for the production and use of bioenergy. The harmonisation of relevant laws and the creation of appropriate institutional and legal linkages is thus a priority in order to harness the environmental and social guarantees afforded by the legislative framework.

Thailand, on the other hand, has put in place a legislative and institutional framework for bioenergy development. The Gasohol and Biodiesel Strategic Plans establish phased-in development of targets and blending requirements. In 2005, Thailand approved its first National Energy Strategy focusing on energy conservation and alternative energy development. Highlighting the need to develop renewable energy, the Energy Industry Act (2007) established the mandate for the Ministry of Energy to develop biofuels standards, which were finalized for biodiesel and gasohol in 2008. In March 2009, a revised 15-year Renewable Energy

Development Plan (2008–2020) was approved by the Cabinet, which envisages increasing the proportion of alternative energy to 20.4 percent of national energy consumption by 2022. The biofuels sector is a key element of this strategy. A National Committee on Biofuels Development and Promotion was established in 2005 to facilitate domestic coordination. The Biodiesel Strategic Plan promotes the expansion of palm oil plantations by 2010 and since February 2008, a 2 percent blend of biodiesel (B2) is mandatory nationwide, with B5 targets in place for 2011. The government is providing incentives to increase palm oil and jatropha cultivation for biodiesel and is promoting community-based biodiesel production to enhance energy self sufficiency at the local level. A National Committee on Food Security was created in 2008 to discuss concerns relating to the impact of the promotion of biofuels on food crops. In addition, a National Commission on Climate Change Policy is tasked with coordinating national policies while the Thailand Greenhouse Gas Management Organization is the designated national authority for the CDM. Thailand has also attempted to begin the transition away from first generation to second generation biofuels based on non-food feedstocks, such as cellulosic materials, oil nuts and algae.

To conclude, a word of caution on the terminology used in this study. Literature on bioenergy often contains definitions with diverse parameters as to what constitutes bioenergy and its various forms have proliferated. In this study, 'bioenergy' is defined to mean "energy generated from biofuels", while 'biofuels' are "fuels of renewable and biological origin, including woodfuel, charcoal, livestock manure, biogas, biohydrogen, bioalcohol, microbial biomass, agricultural wastes and by-products, and energy crops." Attempts have been made to use these terms consistently throughout the study. In the individual case studies, any deviations from these definitions have been clearly spelled out and clear indications provided as to which type of bioenergy is covered by the legal instrument under review. Also ethanol and bioethanol have been used interchangeably.

Prior to the case studies, this legislative study begins by mapping out international commitments that are relevant to bioenergy production, promotion and use. Special emphasis is placed upon three areas of international law: trade, climate change and biodiversity. The relevant international legal instruments are addressed to varying degrees in the case studies and were selected based on their likely influence in shaping

national legal frameworks for bioenergy. All the country studies contain ratification information on the relevant international legal instruments. The second part of the study contains the country reviews, while the third part of the study compares and analyses the main findings and explores legal and other options for ensuring economic, social and environmental sustainability in bioenergy development.

PART I

INTERNATIONAL LEGAL INSTRUMENTS RELATING TO BIOENERGY

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1. INTRODUCTION

There are no intergovernmental mechanisms or international agreements specifically addressing bioenergy, although several multilateral instruments impose obligations with implications for the way in which bioenergy is regulated at national level. Some of the international legally-binding environmental agreements are relevant to bioenergy, for instance. They include the United Nations Framework Convention on Climate Change (UNFCCC) (1992) – which provides that precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects (such as bioenergy production) should take into account different socio-economic contexts, be comprehensive, cover all relevant sources, sinks and reservoirs of greenhouse gases and adaptation, and comprise all economic sectors (art. 4). More explicitly, the Kyoto Protocol recognizes the importance of renewable energy as a contributor to the mitigation of climate change, providing that all parties, taking into account their common but differentiated responsibilities and their specific development priorities, shall formulate, implement, publish and regularly update national and, where appropriate, regional programmes containing measures to mitigate climate change in the energy, transport and industry sectors (art. 10).

The objectives of the Convention on Biological Diversity (1992) include biodiversity conservation and sustainable use of its components (art. 1). Bioenergy feedstocks can be considered both as a component of biodiversity as well as an element of habitat for biodiversity. Key national obligations that may be relevant for bioenergy production include: incorporating biodiversity-related concerns into plans, programmes and policies (art. 6); restoring or rehabilitating degraded ecosystems, and preventing the introduction of invasive alien species (art. 8); carrying out environmental impact assessments for projects likely to have adverse effects on biodiversity (art. 14); and involving local populations and the private sector in sustainable use of the components of biodiversity (art. 10).

Parties to the United Nations Convention to Combat Desertification (1992) are obligated to develop national plans and strategies to combat land degradation and desertification, including agricultural and forestry-related measures of relevance to the bioenergy sector. To this end, the Convention also calls upon parties to facilitate the participation of local populations (art. 5).

International trade law agreements under the auspices of the World Trade Organization (WTO) also affect, and are affected by, domestic regulation of bioenergy, and raise questions relating to classification of biofuels, subsidies and consistency between domestic regulatory measures and the WTO disciplines. Also, international human rights treaties may have implications for bioenergy production and its likely impacts on food security. The International Covenant on Economic, Social and Cultural Rights in article 11 establishes the legal obligation of member states to ensure the most efficient development and utilization of natural resources to ensure the fundamental right of everyone to be free from hunger. In addition, bioenergy initiatives and programmes must respect core labour standards and respective conventions of the International Labour Organization (ILO), and should not hinder the implementation of the Decent Work Agenda, which proposes an integrated approach to rights, employment, social protection and social dialogue, in accordance with the Fundamental Principles and Rights at Work. The latter entails freedom of association and the right to collective bargaining; elimination of forced and compulsory labour; abolition of child labour; and elimination of discrimination in the workplace. Of particular relevance for present purposes is also Convention No. 184 *Safety and Health in Agriculture* (2001), and No. 182 *Worst Forms of Child Labour* (1999). Finally, several global multi-stakeholder initiatives are gaining ground and influencing national bioenergy strategies such as the Global Bioenergy Partnership (GBEP), the Round Table on Sustainable Biofuels and the International Biofuels Forum.

Bioenergy production and use can have significant implications for the achievement of the Millennium Development Goals (MDGs), most notably Goal 1 (eradicate extreme poverty and hunger) and Goal 7 (ensure environmental sustainability). As stated in the Declaration of the High-Level Conference on World Food Security: The Challenges of Climate Change and Bioenergy, convened by FAO in 2008, it is thus essential to address the challenges and opportunities posed by biofuels, in view of the world's food security, energy and sustainable development needs to ensure that production and use of biofuels is sustainable in accordance with the three pillars of sustainable development, and takes into account the need to achieve and maintain global food security.

Overall, none of the above-mentioned international instruments can of themselves provide systematic guidance or create specific obligations for

countries to incorporate the full interplay of connected aspects in the environmental, food, agricultural, trade and energy sectors when developing national policies and legislation on bioenergy. Integrated implementation of these different international instruments is thus necessary at the national level to ensure sustainability in the bioenergy sector. This section zeroes in on the relevance at national level of the international trade law agreements under the auspices of the WTO, the UNFCCC and the Kyoto Protocol, as well as the biodiversity-related conventions for the regulation of bioenergy. The themes highlighted in this section are further explored at national level in the subsequent case studies.

1.1 WTO Agreements and bioenergy

The obligations for member states created by the Agreements under the World Trade Organization (WTO) framework are broad-ranging and affect both international trade in bioenergy products (or feedstock materials such as agricultural crops) as well as domestic regulation of the bioenergy sector. Biofuels fall within the remit of a number of the WTO Agreements: the Agreement on Agriculture (AoA), the Agreement on Sanitary and Phytosanitary Standards (SPS), the Agreement on Technical Barriers to Trade (TBT) and the Agreement on Subsidies and Countervailing Measures (ASCM) all have relevance for bioenergy. Therefore with respect to domestic regulation of this sector, some of the key aspects of national bioenergy regulatory frameworks that are affected by the international trade disciplines include tariffs for end products or raw materials (discussed below), taxes and other regulatory exemption provisions, subsidies and other internal support mechanisms, sanitary and phytosanitary standards (as regards feedstock or raw material) and technical regulations which govern quality and blending.

The case studies highlight a number of these trade-related questions concerning sustainability criteria for imported biofuels, agricultural subsidies, market access and tariffs as well as product standards. The Thailand review, for instance, discusses the link between the production of energy crops and agricultural subsidies. The Argentinean case study explains that national standards for certain biofuels were modified to

comply with the European Union (EU)¹ requirements in order to improve market access. It also draws attention to the restraining impact of tariffs imposed by the US and the EU on Argentina's ethanol exports. The Estonia, Tanzania and Argentina case studies all refer to plans by the EU to introduce sustainability criteria for biofuels and bioliquids used in the transport sector. These criteria apply to biofuels produced within the EU as well as imported ones, thus underscoring the links between international trade law and national legal frameworks for bioenergy.

For the purposes of putting the case studies in context, the following discussion on the relationship between international trade rules and bioenergy shall be primarily from the perspective of developing countries. In this regard, concerns have been raised on the way in which the comparative advantage of developing countries in terms of natural resources, labour and bioenergy production can be hampered by their ability to access foreign markets. This access may be restricted by import, production quality standards and sanitary and phytosanitary considerations, and more recently, environmental and social criteria that are injected as a pre-requisite to market access. In the absence of legally binding international criteria for the sustainable production of bioenergy, these social and environmental criteria may serve an important purpose to ensure that risks heightened by the production of biofuels are diminished. In this way, biofuels production that results in environmental degradation due to the clearing of biodiversity-rich areas such as forests or wetlands, or that leads to negative social impacts such as the diversion of crops from food towards fuel production can thus be curbed. It should be noted that EU sustainability criteria (see further below) for biofuels production, set out in article 17 of the EC Directive 2009/28/EC on the promotion of the use of energy from renewable sources, applies "irrespective of whether the raw materials were cultivated inside or outside the territory of the Community."

International trade of biofuels has not been significant to date – limited in part by low production quantities intended to supply the local biofuels market. An increase in demand is likely to change this scenario, which

¹ It is difficult at this stage of European integration to distinguish the European Community (EC) from the European Union (EU). Should it enter into force, the Lisbon Treaty would, however, put an end to the above-mentioned EC/EU distinction, as a result of endowing the EU with a single legal personality.

would also lead to competition among producer countries to target export markets. The comparative advantage of developing countries in terms of feedstock production may see the rise of bioenergy feedstock exports to countries with significant biofuel consumption. This scenario is not without risks to developing countries who, without adequate policy and legal safeguards in place, may be more susceptible to food insecurity.

As noted above, a number of WTO Agreements impact trade in bioenergy feedstock (raw materials) and processed ethanol and biodiesel. In fact the distinction between trade in raw materials and the biofuel product is significant when considering that tariff escalation systems mean lower import tariffs for raw materials (bioenergy feedstocks) and higher ones for processed goods. This essentially pushes countries that do not have biofuels conversion or processing capacities towards exporting only feedstock thereby reducing their options for any value-added benefits of converting feedstock into biofuels.

The first sticking point of bioenergy and the WTO disciplines involves trade classification which affects tariff reduction commitments and national support schemes that are allowed under the WTO rules. Tariff commitments are expressed as 'bound rates' and are applied on a Most-Favoured-Nation basis (that is, according to the principle of equal treatment among different member state countries, under Article I of the General Agreement on Tariffs and Trade 1994 (GATT)) and are contingent on the Harmonized Commodity Description Coding System (HS) for product classifications. Currently, ethanol falls under the "agricultural goods" category (HS 2207 - ethyl alcohol) while biodiesel is considered an 'industrial good' (H38). This means that ethanol and biodiesel are therefore subject to different tariff rates and subsidies. Furthermore, the ethanol classification under the HS system does not differentiate between fuel and non-fuel uses. This is significant in view of the fact that WTO members may wish to reduce tariffs on ethanol used for environmental policy purposes, while wishing to maintain the tariffs on ethanol for other uses.

Any requirements imposed on imported goods (such as biofuels) must comply with the principle of "national treatment" enshrined in Article III of GATT: accordingly the treatment of imported products must be "no less favourable" than the treatment of domestically produced "like" products "in respect of all laws, regulations and requirements." This again

raises the issue as to whether different types of biofuels are "like" products. WTO member states are required to impose the same tariffs and duties to all imported products that are "like" domestic products regardless of where they originate. Tariff reductions for industrial goods are higher than for agricultural goods implying a more favourable regime for biodiesel products.

Box 1: Examples of internal regulations that may impact trade

- mandates to use particular percentages or quantities of biofuel either in fuel blends or for specific purposes (such as bus or taxi fleets);
- restrictions or limits on the amount or kind of biofuel that can be contained in a blend with conventional fuel;
- specifications of the properties or performance characteristics of particular biofuels or the materials they must be derived from;
- labelling for consumer protection and information purposes;
- health and safety regulations concerning the handling and transportation of particular biofuels or inputs required for the processing of biofuels, and related specifications for processing plants; and
- broad environmental performance requirements related to the entire life-cycle of the product, including the sustainability of the agriculture used to produce the feedstock from which the biofuel is processed.

Source: ITFATPC/IPC. WTO Disciplines and Biofuels: Opportunities and Constraints in the Creation of a Global Marketplace (2006)

Ethanol on the other hand would be subject to the additional obligations espoused in the Agreement on Agriculture, which obligates member states to reduce or eliminate in certain cases domestic agricultural production support mechanisms such as taxes and loans that are actionable or trade distorting. The AoA disciplines subsidies and government support for agricultural products in addition to those contained in the Subsidies and Countervailing Measures Agreement (SCM). Broadly speaking, under the AoA members agree to phase-out non-tariff barriers, such as quotas by turning them into tariff equivalents ('tarification'). Domestic support refers to subsidies provided to agricultural producers regardless of whether their products are exported, and the AoA structures domestic support into categories or 'boxes' which must be reduced over time. All domestic support measures fall under the 'amber box', as measures which are considered to be trade distorting and thus subject to limits, except those support measures that qualify for the

"green box" (i.e. measures that are permitted but must cause no or minimal distortion to trade) and 'blue box' (i.e. subsidies that are tied to schemes that limit production, and may be permitted if conditions designed to reduce distortion are met). Examples of amber box measures include price support or subsidies related to production support. These considerations are all therefore relevant to bioenergy feedstock production. Agricultural producers are given support in different ways, although common elements can be distilled. These elements comprise support designed to guarantee certain levels of income for agricultural producers (often implemented by setting minimum artificial prices that are higher than world market prices), or through direct financial transfers to producers. These support schemes have distorting effects on international trade patterns.

Both biodiesel and ethanol fall under the rules of the ASCM whose objective is to discipline the use of export subsidies and the actions countries can take to counter the effects of harmful subsidies. Relevant issues raised under the rubric of the ASCM revolve around determining the compatibility with the WTO system of different types of subsidies in the biofuels sector: subsidies for the production of biofuels from locally produced feedstock, consumption subsidies such as tax exemptions to biofuel purchasers, biofuel subsidies which may be contingent on export quantities and subsidies under general agricultural support initiatives. In situations where subsidized imports can be shown to have a detrimental impact on the corresponding domestic industry, member states may either seek recourse under the WTO's dispute settlement mechanism or initiate investigations unilaterally and impose an additional countervailing duty. The importance of subsidies for the economic viability of biofuels should nonetheless be borne in mind. This point is consistently illustrated in all of the case studies.

Countries may sometimes impose mandatory blending requirements or environmental and social sustainability criteria in a manner that is considered by some as ostensibly outside the permitted framework of the WTO rules. Here, again an analysis of what constitutes "like goods" is relevant. In the *Asbestos* case, the WTO Appellate Body (AB) set out elements for determining the 'likeness' of a product to include physical characteristics, end-uses, consumer preferences and tariff classification. In this particular case, the AB also accepted health risks as an additional determining factor. This rationale could arguably be extended to biofuels

and provide some justification for regulatory differences between consumer preferred and less health-risk products and those that are less so.

While the design of these policies taking into account social and environmental aspects may be geared towards legitimate sustainability objectives, certain measures may be deemed more trade-restrictive than others. Article XX of the GATT listing general exceptions could be relevant for assessing the compatibility of environmentally motivated trade restrictions on biofuels with international trade law. The WTO case *United States – Import Prohibition of Certain Shrimp and Shrimp Containing Products (US-Shrimp)* concerning the justifiability of environmentally motivated trade restrictions under the general exception of Article XX of the GATT is considered the landmark decision on trade restrictions based on environmental grounds. The US prohibited the importation of shrimp products that were harvested in a manner that would be detrimental to sea turtles, except if the exporting country was certified by the US government as having the necessary safeguards in place to avoid harm to sea turtles. It should be noted that, like the above-mentioned EC Directive, the measure applied equally to imports as well as to domestically harvested tuna. In response to allegations that this import prohibition was not compatible with the WTO rules, the US invoked GATT Article XX(b) and (g). These exceptions are also pertinent to bioenergy. Article XX lists a number of categories under which member states can impose trade restrictions provided that the "measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade." Article XX(b) permits measures "necessary to protect human, animal or plant life or health", while Article XX(g) permits measures "relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption." While the WTO Panel in the *US-Shrimp* case rejected the US defence on the grounds that Article XX could not be used to compel another member state to change its policies, the Appellate Body upheld the decision on different grounds and explicitly rejected the WTO Panel reasoning. In 2001, the Appellate Body clarified its legal reasoning following a challenge by Malaysia of the measures taken by the US to comply with this ruling. The reasoning of the WTO Panel and Appellate Body throughout the history of the case is quite lengthy and complex, as is a discussion as the scope of what is permissible as an environmentally-

based restriction on trade, and therefore for present purposes, it suffices to note that the second Appellate Body hearing found that the corrective measures taken by the US were in compliance with Article XX.

Paragraph 31(iii) of the Doha Ministerial Declaration, which was adopted on 14 November 2001, represents a move towards negotiations for the reduction or elimination of "tariff and non-tariff barriers to environmental goods and services". The question of including ethanol as an environmental good has proved to be a bone of contention among states who wish to see it benefit from accelerated tariff reduction and states who prefer its negotiations to remain under the market access negotiations for agricultural goods.

The productivity, product standards and export competitiveness of feedstocks are subject to hazards such as disease or pests. Sanitary and phytosanitary measures are applied in order to eliminate the risk posed to human plant or animal health by pests, diseases, various food additives or contaminants and would therefore be applicable to agricultural or forest feedstocks for biofuels, including biomass or biowaste. Phytosanitary standards (which would influence agricultural practices) and technical regulations (which shape industrial production) are covered by the SPS and TBT Agreements respectively, both of which seek to prevent technical trade barriers applied to restrict imports and protect local industries. The rules laid down in the SPS Agreement affect the way feedstock is produced and regulates legitimate measures for ensuring plant and plant products are not contaminated by pathogens or pests, and other health and safety considerations. Similarly, the TBT Agreement has implications for any national technical specifications for biofuel conversion processes and associated industries, labelling requirements and the way in which biofuel can be blended with conventional fuel. The most distortive trade measures are usually imposed on agricultural products, and can include certification procedures, quarantine regulations, labelling, setting guidelines on minimum pesticide residues, and requiring certain product or process criteria among others.

The SPS measures imposed by member states are allowed provided they are justified by scientific evidence, but not must not be any more trade restrictive than necessary to protect health. Furthermore such measures should not be arbitrary or discriminate unjustifiably between members where identical or similar conditions prevail. Harmonized standards

through technical regulations enable uniform designs, machinery and inputs are beneficial in terms of economy of production and quality assurance. Article 2 of the TBT Agreement stipulates that member states shall ensure that technical regulations are not written or enforced with the effect of creating unnecessary obstacles to international trade; and any restrictive practices therefore must fulfil a legitimate objective (this could be interpreted to mean the protection of human health or safety or the environment). The Agreement therefore has broad implications for national laws and regulations which define the requisite standards of biofuel products, including processing and production methods, such as blending requirements and bioenergy conversion machinery.

Overall, WTO Agreements must be implemented in a manner that ensures any negative effects on the comparative advantages of developing countries are minimized as are any adverse effects on poverty reduction, food security and environmental sustainability. As a concluding point, it will not only be WTO Agreements which will impact national bioenergy policies with respect to international trade. The legislation in major import markets can be expected to affect the national laws of exporting countries. The EU has recently set out sustainability requirements for imported products relating to the implementation of its 10 percent target for the use of biofuels and bioliquids in the transport sector by 2020. The criteria are contained in the recent EC Directive 2009/28 (23 April 2009) on the promotion of the use of energy from renewable sources, which forms part of a comprehensive post-2012 package on climate change and energy. The Directive sets out sustainability criteria for biofuels and bioliquids irrespective of whether the raw materials were cultivated in or outside the territory of the Community, thus highlighting the nexus with international trade. The Directive stipulates, for example, that biofuels and bioliquids must not be made from raw material obtained from land with recognized high biodiversity value (art. 17.3), or land with high carbon stock (art. 17.4).

The aim for present purposes is not to assess whether the European sustainability criteria is compatible with WTO law, but to highlight the need to design national legal frameworks for bioenergy in such a way that takes into account requirements deriving from international trade law. The case study on Argentina, for instance, stresses the desire to avoid costly bureaucratic procedures and certification schemes to implement the EU's planned sustainability scheme, and recommends addressing this

through consultations between the EU and Mercosur (the regional trade agreement between Argentina, Brazil, Paraguay and Uruguay). On the other hand, the European Commission recommends that the EU benefit from encouraging the development of bilateral and multilateral agreements and voluntary international and national schemes setting standards for the sustainable production of biofuels and certifying that the production of biofuels complies with such standards. The case study on Argentina also highlights the impact of European and American ethanol tariffs on Argentinean exports, and makes reference to proposals by Brazil at the WTO to reduce barriers on biofuels.

1.2 The Kyoto Protocol and national legal frameworks for bioenergy

Of the seven countries analyzed in this paper, Estonia, a country in transition to a market economy, is listed in Annex I of the UNFCCC and has a target to reduce its greenhouse gas emissions under Annex B of the Kyoto Protocol between 2008 and 2012. The five other case study countries are classified as non-Annex I countries under the UNFCCC and therefore qualify to host CDM projects in accordance with Article 12 of the Kyoto Protocol.

This section seeks to explain the influence of the international rules of the CDM on national legal frameworks for bioenergy in the countries under review in the study, and looks at the impact of the CDM on national bioenergy sectors.

1.2.1 General rules on the Clean Development Mechanism

The Clean Development Mechanism (CDM) is one of three market-based flexible mechanisms created under the Kyoto Protocol. Its dual objective is to assist developing countries in achieving sustainable development and to enable industrialised countries to comply with their quantitative emission reduction targets under the Kyoto Protocol (KP) Article 12(2). Generally, the sale of carbon credits under the CDM is possible for such projects that either reduce emissions of the six greenhouse gases covered by the Kyoto Protocol (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride) or enhance their removal from the atmosphere by carbon sinks in non-Annex I countries (mostly developing countries). In

principle, it is thus possible for different types of bioenergy projects to benefit from carbon funding under the CDM. Several bioenergy projects have indeed taken advantage of this opportunity since the 'early launch' of the CDM in 2000 (art. 12(10)). Most of them involve methane recovery and electricity generation – which is also evident from the case studies contained in this report. The popularity of such projects can be explained by the fact that methane is a potent greenhouse gas and leads to cost effective emissions reductions. According to the Intergovernmental Panel on Climate Change, the global warming potential of methane is 21 while that of carbon dioxide is 1. The CDM is expected to generate some 2.7 billion Certified Emission Reductions (CERs) during the Kyoto Protocol's first commitment period from 2008 to 2012. Financial flows associated with the CDM are thus estimated to be rather significant and during the first half of 2007, trade in CERs was worth 4.1 billion euros.

The CDM market has been dominated by a few large and economically advanced host countries while smaller and poorer countries attract far less CDM financing. From a regional perspective, the Asia and Pacific region hosts 1289 (73.24 percent) of CDM projects, followed by Latin America and the Caribbean which hosts 429 (24.38 percent) and Africa 32 (1.8 percent).² Other regions account for 0.57 percent of the projects. China, India and Brazil have the greatest share of CDM projects 34.34 percent, 25.51 percent and 9.09 percent respectively. Of the countries reviewed in this study, Argentina currently hosts 15 registered CDM projects, Brazil has registered 160, Mexico 117, Thailand 18, the Philippines 39, and Tanzania 1.³

To be eligible to participate in the CDM, non-Annex I countries must appoint a Designated National Authority (DNA) responsible for the approval of CDM projects, who confirms that the projects contribute to sustainable development in the host country. The CDM project cycle is strictly regulated by the Modalities and Procedures for a Clean Development Mechanism adopted in 2005 (in accordance with art. 12 of the Kyoto Protocol). The objective of these rules is to ensure that CDM projects lead to real and verifiable emissions reductions, thereby safeguarding the environmental integrity of the Kyoto Protocol. The

² See www.unfccc.int, as updated on 10 August 2009.

³ *Ibid.*

project cycle entails independent validation of each project activity prior to its registration, regular monitoring of emission reductions as well as independent verification and certification of reduced emissions.

The CDM is administrated by the Executive Board for the Clean Development Mechanism (CDM Executive Board; Kyoto Protocol, Article 12(4)). It approves all CDM projects and issues CERs, which can be traded by state parties to the Protocol as well as by private entities authorized by their governments to participate in the CDM (Kyoto Protocol, Art. 12(9)).

1.2.2 "Additionality" criteria and baseline methodologies for bioenergy projects

One of the fundamental principles of the CDM is that each project must lead to emissions reductions that are additional to what would occur without the project (Kyoto Protocol, Article 5). This requirement is highly relevant for potential host countries and in this report, the case studies on Mexico and the Philippines address this question in relation to national legislation on biofuels. This section provides a brief overview of the influence of international CDM rules on questions concerning additionality.

In general, the additionality of each CDM project is demonstrated by describing the baseline scenario, in other words, by identifying the likely alternative for each project and estimating how much greenhouse gas emissions would have been generated in the absence of the project. In accordance with the CDM rules, the baseline and estimation of emissions reductions must be based on a baseline methodology approved by the CDM Executive Board. In the methodological work, the CDM Executive Board is assisted by the CDM Methodology Panel.

For determining additionality, the most important instrument is the "Additionality Tool" developed by the CDM Executive Board. It comprises a series of sequential tests designed to demonstrate that the project would not have taken place without the CDM. The first step is to identify alternatives for the project activity that are consistent with the host country's laws and regulations. Next, an investment analysis shows whether or not the proposed CDM project is economically and financially the most attractive alternative. Subsequently, an optional

barriers analysis will demonstrate whether there is at least one alternative for the project that is not prevented by identified barriers. The complementary fourth step is a common practice analysis to show that no similar project activities can be commonly observed or that there is an essential difference between the proposed CDM project and existing activities.

This raises the issue as to how the host country's mandatory legislation affects the additionality of CDM projects and whether this would be a disincentive for the development of national legal frameworks, for instance, on bioenergy. Thus, for some of the non-Annex I countries included in this study, the question emerges as to how the mandatory blending requirements for bioethanol and biodiesel affect countries' opportunities to benefit from CDM funding in this sector. In a proposed CDM project in Brazil, the CDM Methodology Panel stressed that mandatory blending requirements for biodiesel had to be taken into account in the estimation of baseline emissions and that emission reductions could be credited only based on the fraction of biodiesel above that required by the law. CDM projects were thus not excluded, but the mandatory blending requirements affected the availability of "additional" emission reductions.

Several baseline and monitoring methodologies have been approved by the CDM Executive Board for bioenergy projects, which can and have been used for the benefit of CDM projects in countries included in this report. Consolidated methodologies have been approved for landfill gas project activities (ACM0001), projects generating electricity from biomass residues (ACM0006) and projects leading to greenhouse gas emission reductions from manure management systems (ACM010). Methodologies focusing exclusively on bioenergy have also been approved, *inter alia*, for the following project types: avoided emissions from organic waste through alternative waste treatment processes (AM0025); fuel switch from fossil fuels to biomass residues in boilers for heat generation (AM0036); grid-connected electricity generation using biomass from newly developed dedicated plantations (AM0042); production of biodiesel based on waste oils and/or waste fats from biogenic origin for use as fuel (AM0047); biogenic methane injection to a natural gas distribution grid (AM0053); and avoided emissions from biomass wastes through use as feed stock in pulp and paper production or in bio-oil production (AM0057).

A proposal was considered for a methodology applicable to bio-ethanol facilities using starch as the main material (NM0253). Accordingly, bio-ethanol would be blended with gasoline and commercialized within the domestic market of the host country. In August 2008, the CDM Executive Board decided not to approve this proposal (ref. CDM-EB-41). Concerning bioethanol and biodiesel, one of the unanswered methodological issues is that the CDM Methodology Panel has not decided how to address the "shift of pre-project activities" associated with biofuel projects. In other words, it has not decided how to calculate greenhouse gas emissions reductions in cases where biofuels are produced in dedicated plantations on existing agricultural land or sourced from the general market where their origin can be identified.

Overall, while some concerns have been associated with the CDM, especially concerning the geographical and sectoral distribution of CDM projects, there seems to be a broad consensus among the parties to the Kyoto Protocol that the CDM should continue in the post-2012 period and that it should possibly be expanded from project activities to sectoral activities. What this means for bioenergy activities is that this funding window for developing countries could remain in place for years to come and could possibly be expanded in the post-2012 period. However, additional efforts would seem to be necessary to ensure that smaller developing countries as well as renewable energy projects can take full advantage of this international funding instrument.

1.3 Biodiversity-related conventions

In 2008, the parties to the Convention on Biological Diversity (CBD) and to the Ramsar Convention on Wetlands of International Importance specifically addressed bioenergy and its impacts on biological diversity in general, and on wetlands specifically. The decisions that have been adopted in the framework of the two conventions provide useful elements for national legislators and policy-makers to apply at national level in seeking to ensure the environmental sustainability of bioenergy production and use.

The CBD Conference of the Parties (COP), in its decision *Agricultural biodiversity: biofuels and biodiversity* (Decision IX/2), recognized the need to promote the positive, and minimize the negative, impacts of biofuel production and use on biodiversity and the livelihoods of local and

indigenous communities. To this end, it supports the full and effective participation of indigenous and local communities in the implementation of activities relevant to the sustainable production and use of biofuels. With particular regard to the need to adopt appropriate policy frameworks to ensure the sustainability of biofuels production and use, the COP identified a series of relevant international standards that should be taken into account, namely:

- the precautionary principle, as defined in the CBD Preamble (that is, "where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat");
- the Addis Ababa Principles and Guidelines on Sustainable Use (Decision VII/12);
- the application of the ecosystem approach, as defined in Decision V/6;
- the voluntary guidelines on biodiversity-inclusive impact assessment (Decision VIII/28);
- the work programme on protected areas (Decision VII/30);
- the work programme on traditional knowledge (CBD, Art. 8.(j) and Decision V/16);
- The Akwé: Kon Voluntary Guidelines for the conduct of cultural, environmental and social impact assessment regarding developments proposed to take place, or which are likely to impact on sacred sites, and lands, and waters traditionally occupied or used by indigenous people and local communities (Decision VII/16F);
- the Global Strategy for Plant Conservation (Decision VI/9);
- the guiding principles on alien invasive species (Decision VI/23);
- the application of sustainable forest management and best agricultural practices in relation to biodiversity;
- national biodiversity strategies and action plans; and
- relevant guidance developed under the Cartagena Protocol on Biosafety.

Sustainable use emerges as the most significant concept in the CBD with regards to bioenergy. It is defined by the Convention as using biodiversity components in a way and at a rate that does not lead to the long-term decline of biological diversity, thus meeting the needs and aspirations of present and future generations (Art. 2). Bioenergy production should thus aim at ensuring the sustainable use of feedstocks. The Addis Ababa Principles and Guidelines provide specific guidance in

this respect, stressing the need to consider local customs and traditions and to develop supportive incentive measures when drafting new legislation and regulations. The Principles, moreover, underline the need to resolve any overlaps, omissions and contradictions in existing laws and policies; and highlight the benefits of creating cooperative and supportive linkages between all levels of governance in order to avoid duplication of efforts or inconsistencies. Other relevant tenets in the Addis Ababa Principles that can be applicable to bioenergy production refer to the need to: undertake adaptive management informed by iterative, timely and transparent feedback concerning the use, environmental and socio-economic impacts, and the status of the resource being used; avoid or minimize adverse impacts on ecosystem services; minimize waste; and reflect the needs of indigenous and local communities who live with, and are affected by the use and conservation of, biological diversity in the equitable distribution of its benefits.

The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Given that bioenergy production cuts across different sectors, this approach is particularly important at the planning stage. It entails a social process – different interested communities must be involved through the development of effective structures and processes for decision-making and management of natural resources. Guiding principles for its implementation include decentralization, consideration of adjacent and other ecosystems, long-term objectives and integration of use and conservation of biodiversity.

The CBD Voluntary Guidelines on Biodiversity-inclusive Impact Assessment aim at ensuring the incorporation of biodiversity considerations into the environmental impact assessment (EIA) procedure, as this may not necessarily result from the general requirement to take environmental issues into account. Therefore, according to these Guidelines, new criteria should be incorporated into the screening process, to include the categories of activities that may specifically affect biological diversity. Activities taking place in legally protected areas or their vicinity may fall under mandatory EIA, as could the base for bioenergy production. An activity that does not fall under mandatory EIA but is suspected to significantly impact biodiversity should also be assessed: this is the case with the introduction of invasive alien species, activities which directly or indirectly affect species that are

not yet legally protected but are threatened or sensitive, and activities in biologically important areas. Once again, bioenergy production could fall into one of these categories. On the same issue, the Akwé: Kon Voluntary Guidelines provide guidance to parties and governments on the incorporation of cultural, environmental, and social considerations of indigenous and local communities into new or existing impact assessment procedures. The guidelines may, therefore, be particularly relevant to the proponents of bioenergy production developments in the vicinity of sacred sites or traditionally occupied lands.

With regards to sustainable forest management, national legislators and policy-makers may make reference to the Forest Principles, which were adopted in 1992 at the Rio Conference on the Environment and Development and epitomized international consensus on the holistic nature of forest resource management and conservation. These Principles enshrine globally accepted concepts such as the need for forest management planning, environmental impact assessment, information disclosure, public participation and protection of traditional knowledge. Woodfuel production should therefore observe these minimum requirements.

The CBD work programme on Protected Areas may have significant implications for bioenergy production that is to be undertaken in the proximity of these areas, or that may otherwise impact them. It focuses on series of key elements that countries usually incorporate in their national policies and legislation, such as the integration of protected areas into the larger landscape and other sectoral planning; the prevention of the negative impacts of key threats to protected areas; the harmonization of sectoral policies and laws to ensure that they support the conservation and effective management of the protected area system; the removal of perverse incentives and inconsistencies in sectoral policies that increase pressure on protected areas, or action to mitigate any perverse effects.

The CBD work programme on Traditional Knowledge provides guidance on how to achieve the commitments in Article 8(j) of the CBD to respect, preserve and maintain the knowledge, innovations and practices of indigenous and local communities which embody traditional lifestyles relevant for the conservation and sustainable use of biological diversity; to promote their wider application with the approval and involvement of the holders of such knowledge; and to encourage the equitable sharing of

the benefits arising from the utilization of such knowledge. Bioenergy projects may entail negative impacts on traditional practices relevant for biodiversity conservation and sustainable use, for example by displacing indigenous and local communities or impeding their practices. These considerations should therefore be taken into account in the planning of bioenergy production activities, and opportunities for consultation with local and indigenous communities should be provided to this effect.

Article 8(h) of the CBD calls upon parties to prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species. Bioenergy production may entail the (intentional or unintentional) introduction of alien species into the environment. Thus, the guiding principles on invasive alien species are relevant to reinforce the need to adopt a precautionary and ecosystem-based approach, assign priority to preventing the introduction of invasive alien species and base decisions of intentional introductions of these species on prior risk analysis.

In 2008, the Conference of the Parties to the Ramsar Convention followed up on the CBD COP Decision on biofuels, to provide specific guidance with respect to the possible negative impacts of bioenergy on wetlands. The Convention calls upon parties to designate wetlands in their territory for inclusion in a List of Wetlands of International Importance. The Convention further requires parties to promote the conservation and "wise use" of the designated wetlands, for example by establishing nature reserves. In its resolution on biofuels, the COP recognized that biofuel crops vary with regard to their water demands; some crops may be grown on degraded land which could assist in the rehabilitation of wetlands, with associated benefits for human use. It noted that potential competing demands upon agricultural land for food and biofuel production may lead to pressures for the conservation of wetlands and other threatened ecosystems, taking into account that the conversion of wetlands risks releasing high levels of greenhouse gases from the carbon stored by wetlands. The COP recommended taking into account the full range of ecosystem services provided by wetlands (which includes carbon storage, flood protection, food and fibre production, and groundwater recharge). In situations where proposed biofuels crop production activities may affect Ramsar sites and other wetlands, the COP recommends an environmental impact assessment and a strategic impact assessment, and where damage avoidance is not possible, the

application of appropriate mitigation measures, compensation and/or offset actions. It finally stressed the importance of adopting appropriate land-use policies, promoting sustainable forest and agricultural practices, and applying the precautionary principle (Resolution X.25).

Overall, biodiversity-related conventions highlight a host of considerations and legal tools that policy-makers and legislators should integrate in developing policies, legislation and projects for the bioenergy sector.

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PART II
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A. ARGENTINA

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1. INTRODUCTION

This chapter starts by looking at pertinent international legal instruments to Argentina's bioenergy framework. It then illustrates national general and specific fuel legislation, institutional structure and interagency coordination, blending and procurement requirements, fiscal incentives, quality standards, promotion of small and medium-sized enterprises and agricultural development, public information and stakeholder participation, international trade issues including export taxes, environmental rules and labour and social guarantees. The broader policy objectives contained in national programmes and initiatives are also addressed. The final section summarizes key features of the regulatory framework and outlines possible options to improve Argentina's legislation.

1.1 Argentina's energy balance

According to official data, Argentina's energy balance for 2005 (comprising all primary energy sources), indicates that renewable energy accounts for around six percent of overall consumption. The country relies mostly on fossil fuels (natural gas at 49 percent and oil at 41 percent) with a three percent consumption of nuclear energy. Renewable sources of energy are divided between hydropower at four percent, bagasse at one percent and woodfuel at one percent. Nevertheless, Argentina is a net energy exporter (oil and derivatives) but experts foresee a change from surplus to deficit in the short term, as investments lag behind an increasing demand fostered by artificially low domestic energy prices and a fast-growing economy (growth averaged nine percent in 2003–2007). Energy availability will be a constraint for economic growth in Argentina in the next few years, unless investments, and the regulatory changes needed to channel more resources to the energy sector, are made.

The attention currently placed on Argentina's energy sector by national authorities focuses on the need to ensure enough supply of imported fuel (mostly natural gas and fuel oil) to protect the domestic consumers from the effects of gas shortages in winter. National legislation is oriented towards keeping domestic prices isolated from rising international fossil fuel prices, in order to prevent inflation, preserving the national industry's competitiveness, and protecting consumers. The current regulatory scheme is oriented towards short-term goals, without being necessarily consistent with the need to attract long-term investments to the energy sector. For example, representatives of the oil and gas sector claim that as part of negotiations

with the government to allow the export of gasoline, they have been selling diesel at a loss in the domestic market.

1.2 Agricultural production and bioenergy

Argentina's agricultural sector focuses on the production of soy and its derivatives for export. The use of soy and other crops for biofuel production thus offers attractive prospects in a country with 31.2 million hectares of cultivated land (an area the size of Poland), producing 95 million tonnes of agricultural crops.

The soy conglomerate and favourable international market prices are driving the biodiesel sector in Argentina. Soy is the most important crop exported by the country (47.5 million tonnes in 2007–2008), it occupies more than half the land devoted to agriculture (16.1 million hectares), and constitutes an important source of fiscal revenue through a 35 percent export tax placed on soybean exports.¹ Notwithstanding the positive development effect that having a high-value crop generates on the surrounding communities, serious concerns have been raised about the total area devoted to soy monoculture in Argentina with genetically modified seeds. This area has quadrupled since the 1990s and moved into lands previously unsuitable for agricultural activities, altering valuable ecosystems like forests and wetlands.

As the third largest producer of soybeans and largest exporter of soybean oil, Argentina has the capacity to develop a robust biodiesel industry. The country has a modern and efficient production chain, with infrastructure to produce, transport, store and export biodiesel, as well as a milling capacity of 150 000 tonnes per day, thus presenting an optimal situation for the addition of biofuel production to the vegetable oil sector. The oilseed industry is fully export-oriented (90 percent of the overall production is exported) and vegetable oil presses are strategically located in coastal areas.² Biofuel plants under construction are following the same pattern, most being located around ports in the Province of Santa Fe.

¹ Secretary of Agriculture, 2007.

² FAO, 2007.

Bioethanol, on the other hand, has not attracted export-oriented investment, and research reveals that the domestic market and government promotional policies are likely to be the main drivers for investments. The sugar industry in Argentina already has a modern industrial infrastructure producing alcohol from sugar cane (mostly for medicinal purposes), with the possibility of upgrade existing facilities for bioethanol production to satisfy the domestic regulatory demand. Costs of production, however, would not allow competition in domestic or international markets as both are highly distorted. For instance, gasoline in Argentina is subject to price controls, and international prices for ethanol are determined by subsidies in industrialized nations. The industry is therefore geared towards options created by a new biofuels promotional regime, and assessing the price formula to be established by the government, in order to determine whether the approximately 200 000 tonnes of ethanol needed to satisfy domestic regulatory requirements by 2010 will be economically viable and justify investments in this field.

In the case of biogas, small projects exist mostly for self-consumption (examples of which will be provided in section 2.4.3 on the Clean Development Mechanism). Therefore, government policies do not target this sector as the production of biogas on a commercial scale is not competitive as compared with compressed natural gas.³

Bioenergy contributes a negligible amount of energy to the national market, although it is expected that it will increase its share in the transport sector after 2010. Currently, the production of biodiesel in Argentina is for export, with international market prices as the main drivers behind investments in this field.

2. LEGAL FRAMEWORK FOR BIOENERGY

Argentina is a federal state. Its national Constitution (1853, as amended in 1994) distributes responsibilities among federal and provincial authorities and determines whether laws and regulations will be uniform at the national level or vary among the different provinces.⁴ As a general rule, the use of natural resources is under provincial jurisdiction (art. 124), and the federal government may only issue minimum standards for environmental

³ Lamers, P. 2006.

⁴ For an English translation of the Argentine National Constitution see www.senado.gov.ar.

protection (art. 41). The federal government has therefore only a limited jurisdiction to legislate on issues such as land use and agricultural production methods. On the other hand, commerce and international trade fall under federal jurisdiction (arts. 75 and 126) and are thus regulated uniformly across the country. Legal mechanisms used by the federal government to promote the production and consumption of bioenergy thus focus on the regulation of international and inter-provincial trade in fuels, or on the promotion of certain activities by granting federal tax exemptions.

Legislation affecting the production and consumption of bioenergy may originate from different areas of law, such as international rules emanating from trade and environment multilateral treaties, national legislation applicable to the energy sector regulating fuels and biofuels, as well as investment promotion regimes, environmental legislation and social guarantees and labour legislation at the national level. These will be examined in turn in the following subsections.

2.1 International law relevant to the biofuels sector

Argentina is a member of the World Trade Organization and Mercosur (a customs union including Brazil, Uruguay, Paraguay and Argentina), and a party to several environmental conventions. The main international agreements with relevance to the biofuels sector, to which Argentina is a party, include: the Mercosur customs union approved by Law 23.981 (1991); the Convention on Biological Diversity, approved by Law 24.375 (1994); the United Nations Framework Convention on Climate Change, approved by Law 24.295 (1994) and its Kyoto Protocol approved by Law 25.438 (2001); and the United Nations Convention on the Combat of Desertification, approved by Law 24.701 (1996).

2.2 Legislation governing the energy sector

The primary energy sector legislation applicable to bioenergy is Law 26.093 (2006) on a promotion and regulation regime for biofuel production and sustainable use (*Régimen de Regulación y Promoción para la Producción y Uso Sustentables de Biocombustibles*), hereafter referred to as the Biofuels Law (2006), and Law 17.319 (1967) on Fossil Fuels (*Ley de hidrocarburos*) – which is an umbrella law applying to all fuels – as well as related regulations containing restrictions or incentives for the establishment of a biofuels market. As subsequent sections will show, the energy sector in Argentina is highly

regulated, with few participants and a high degree of government intervention to control or influence fuel prices.

Laws applicable to the fuels sector are highly complex as they reflect ongoing negotiations between the government and the private sector to maintain domestic price levels isolated from rising international prices. This is reflected in several resolutions by the Secretary of Energy such as Resolution 715/2007 on compensation of diesel volumes; Resolution 1834/2005 on ensuring domestic supply of liquid fuels (particularly diesel oil); Secretary of Energy Resolution 265/2004 on preventive measures to ensure the supply of natural gas in the domestic market; and Secretary of Domestic Commerce (SECI) Resolution 25/2006 on the regulation of gas oil commercialization.

2.2.1 Fossil Fuels Law (1967)

The framework law for the regulation of fuels in Argentina is Law 17.319 (1967) on Fossil Fuels, which notwithstanding its title, has three articles applying *mutatis mutandis* to biofuels. Decree 109/2007 on the Regulation of the Biofuels Law (hereinafter referred to as the Biofuels Decree) confirms that all activities related to the production, blending, distribution, sale, consumption and sustainable use of biofuels shall be governed by articles 2, 3 and 6 of the Fossil Fuels Law to the extent that they are not specifically regulated by the Biofuels Law and Biofuels Decree. The same articles state that the federal government will determine the national policy for activities related to the exploitation, industrialization, transport, and commercialization of fuels (art. 2), with the overarching objective of satisfying national fuel needs with domestic production (art. 3).

The Fossil Fuels law enables enterprises with permits for biofuel production to transport, commercialize, and industrialize the fuel, as long as they remain in compliance with the regulations dictated by the Executive Power, which should be based on reasonable technical and economic criteria, contemplate the needs of the internal market and stimulate the production of these fuels. The law specifically provides that when national demand for liquid fuels is not met by national production, all fuels must be sold in the domestic market, except if justified technical reasons require otherwise. It also enables the Executive Power to determine the criteria to allow the export of fuels and their derivatives, and to regulate operations in the internal market to allow a rational and equitable participation by all producers in the country (art. 6).

The Fossil Fuels Law is supplemented by 165 laws and regulations, which, since the year 1967, have defined the legal framework applicable to the fuels sector. Those that are the most relevant to biofuels will be described next.

2.2.2 Biofuels Law (2006) and related regulations

The Biofuels Law and Biofuels Decree set out the institutions that will regulate the biofuels industry in Argentina and establish a fifteen-year regime to promote liquid biofuels. The Biofuels Law establishes an institutional architecture for the implementation of biofuel legislation; assigns tasks to government agencies; establishes a regime to promote biofuels through fiscal benefits granted to specific projects; and sets a mandatory blending requirement of 5 percent of bioethanol or biodiesel in gasoline and diesel oil, respectively, as from 1 January 2010.

The Biofuels Law defines biofuels as "bioethanol, biodiesel and biogas that are produced from agricultural or agroindustrial inputs, or organic waste" and which comply with the quality standards adopted by the law's implementing authority (art. 5). The activities addressed by the law are the production, blending, commercialization, distribution, consumption and sustainable use of biofuels, although the main focus is on the institutional framework and the supportive fiscal regime (art. 1). The production of sugar cane for the bioethanol production chain has also been added to the activities eligible for fiscal benefits by Law 26.334 (2007) on the promotion of bioethanol production (*Régimen de Promoción de la Producción de Bioetanol*). This is because, pre-existing sugar mills and facilities that already produced alcohol and with a potential for bioethanol production, had been excluded from the remit of the Biofuels Law.

The limited jurisdiction of the federal government over natural resource management explains the Biofuels Law's focus on matters that are under the federal jurisdiction, such as fiscal benefits. The law also urges provinces and the City of Buenos Aires to adhere to the principles contained therein, and to adopt similar promotional regimes within their jurisdictions (art. 20). The Province of Santa Fe, where most biodiesel plants are located, for example, has complied with the Biofuels Law through the Province of Santa Fe Law 12.691 (2006) and adopted its own fiscal benefit programme for bioenergy production facilities (Province of Santa Fe Law 12.692 (2006) on a promotional regime for non-conventional renewable energies).

The following subsections will review the main aspects of the Biofuels Law and related regulations, while issues relating to environmental protection in the Biofuels Law will be addressed in subsection 2.4.

Institutional structure and interagency coordination

The Biofuels Decree designates the Ministry of Federal Planning, Public Investment and Services (Ministry of Federal Planning) through its Secretary of Energy, as the primary Implementing Authority for the Biofuels Law. The Ministry of Economy and Production (the Ministry of Economy) is the implementing authority regarding the determination of the fiscal quota for benefits applicable to biofuels (arts. 2–4). The tasks allocated by the Biofuels Law (art. 4) and Biofuels Decree (arts. 3 and 10) to the implementing authority for the promotional regime refer mostly to authorizations, control and administration of biofuel fiscal benefits and include the following functions: promote and regulate the production and sustainable use of biofuels; authorize the activities of firms engaged in the production, blending and commercialization of biofuels; authorize the export of biofuel products by registered entities; establish quality standards for biofuels; set criteria and requirements to be met by biofuel facilities; issue permits for biofuel projects and facilities; establish selection criteria and requirements to determine which projects will receive benefits created by the Biofuels Law, and decide on their approval and duration; perform audits and inspections to production plants to control their compliance with existing regulations; control all activities related to the exploitation, industrialization, transport and commerce of biofuels; apply sanctions, including fines and permit cancellations, to facilities and beneficiaries that fail to comply with regulations; request estimations on biofuel demand from all firms required to use biofuels, including oil refineries, blenders, wholesale distributors and fuel retailers; administer subsidies determined by Congress; modify blending requirements; allocate fiscal benefits among small and medium-sized enterprises to promote regional development; determine a monitoring and control fee; maintain an updated public registry of permits awarded to biofuel production and processing plants, as well as an online list of those firms that receive the promotional benefits; publish reference prices for biofuels and provide an annual estimate of the total volume of biofuels required to meet domestic market needs; publish the requirements applying to permits, regarding process, safety and environmental protection; authorize all new fuels (or fuel blends); and ensure that a product's quality is checked prior to final approval.

Through Secretary of Agriculture Resolution 35/2009, a new Agroenergy Division within the Secretary of Agriculture was created to promote the production of biofuels that favour the diversification of agricultural production, and perform studies on biofuels energy and greenhouse gas emission balance.

A National Advisory Board for the Promotion of Production and Sustainable Use of Biofuels (*Comisión Asesora Nacional para la Promoción de la Producción y Uso Sustentables de los Biocombustibles*) was also created by the Biofuels Law to provide assistance to the Secretary of Energy in the legal, technical and administrative aspects of the biofuels regulation. The Advisory Board is presided by a representative of the Secretary of Energy and includes a representative from each of the following government agencies: Secretary of Agriculture Livestock, Fisheries and Food (Secretary of Agriculture); Secretary of Environment and Sustainable Development (Secretary of Environment); Secretary of the Treasury; Secretary of Economic Policy; Secretary of Trade and Industry; Ministry of Science, Technology and Productive Innovation (Ministry of Science); and the Federal Public Revenue Administration; as well as by any other public or private institution which may contribute to the fulfilment of the tasks allocated to the Implementing Authority (Biofuels Law, art. 3 and Biofuels Decree, art. 6). In practice, the National Advisory Board serves as a mechanism for interagency information sharing, but does not participate in the final stages of policy-making, which are usually defined by the Secretary of Energy.

Other government agencies have been assigned tasks to be developed through specific programmes and under their own budgets (arts. 15.5–15.7). For example, the Secretary of Agriculture is tasked with promoting crops for biofuel production that favour the diversification of the agricultural sector. The Under-Secretary of Small and Medium-sized Enterprises (*PyMES*) is tasked with promoting the acquisition of capital goods by small and medium-sized enterprises to produce biofuels. The Ministry of Science is tasked with promoting the research, cooperation and transfer of technology among small and medium-sized enterprises and relevant institutions. The Biofuels Decree also requests the Secretary of Environment to adopt necessary measures to support the application of the Kyoto Protocol's Clean Development Mechanism (CDM) to projects which benefit from the Biofuels Law.

Blending and procurement requirements for bioethanol and biodiesel

The Biofuels Law sets out a 5 percent minimum mandatory blending requirement for all diesel and gasoline sold within the domestic market with biodiesel or bioethanol, respectively, as from 1 January 2010. It allows the Secretary of Energy to alter these blending percentages and set the price for the biofuels. The Secretary of Energy may increase the percentage according to the growth of the domestic market or decrease them upon situations of proven shortages (art. 7). It also sets out government procurement requirements for biofuels in quantities to be determined by the Secretary of Energy as from 2010 (art. 14). It states that blending facilities selling gasoline and diesel will have to purchase fuel from biofuel plants that are beneficiaries of fiscal incentives, at prices defined by the Secretary of Energy. The same facilities may only purchase fuel from other plants when the beneficiaries' supply is exhausted (Biofuels Law arts. 9 and 15.4, and Biofuels Decree art. 12). Government agencies estimate that the biofuels supply likely to be needed in 2010 to satisfy the mandatory blending requirement will be around 625 000 tonnes of biodiesel and 200 million litres (160 000 tonnes) of bioethanol, per year.⁵

In 2008 a price formula was adopted to indicate how the price of bioethanol would be determined in the domestic market once the mandatory blending requirement for biofuels enters into force in 2010. Secretary of Energy Resolution 1294/2008 (on the Bioethanol Purchase Price Determination Procedure) establishes: a formula to determine bioethanol reference prices (which will be mandatory to those projects receiving fiscal benefits as a result of the Biofuels Law); a reference price to be calculated monthly according to the formula adopted in the Annex and published online; and the price to be established based on the highest price resulting from two formulas detailed in the Annex minus 3 percent. The first formula considers costs plus earnings based on a reference project; and the second formula uses the average price of gasoline.

Existing biodiesel plants could cover this estimated domestic demand, but as they are export-oriented and do not comprise agricultural producers (as required by article 13) they are not eligible to benefit from the fiscal benefits of the Biofuels Law. New biodiesel plants focusing on domestic supply will thus need to be built before 2010 and bioethanol plants built or upgraded

⁵ FAO, 2007.

by 2010. It is difficult to say whether or not the needed infrastructure will be operational in time. In addition, procurement rules require blenders to buy first from Biofuels Law beneficiaries, which may not be the most convenient solution for distribution purposes and may create unnecessary barriers in the resulting market.

At the present rate, with no plants to supply the domestic market under construction, many stakeholders question the likelihood that in two years enough facilities will be ready to satisfy the five percent requirement and highlight the importance of a prompt price-setting of biofuels by the government. Industry participants express doubts over the setting of prices by the government, in light of a similar programme implemented in the 1970s to promote a 15 percent ethanol blend in 12 Argentine provinces. This earlier scheme was subsequently dismantled, with the consequent loss of investments due to the government's inability to keep prices adjusted during the hyperinflation that hit the country in 1989. Authorities, however, remain optimistic that the plants oriented at the domestic market will be built during the next two years and that the price set will be attractive for investments in the domestic market to cover the 5 percent blending requirement.⁶

Fiscal incentives

The Biofuels Law creates fiscal incentives, limited by an overall annual fiscal quota to be defined in the national budget and expected to provide benefits to facilities producing a volume of biofuels that is sufficient to supply the 5 percent mandatory biofuels blending requirement.⁷ If demand for benefits exceeds the quota (i.e. if projects built to supply the domestic market exceed the 5 percent biofuel volume for any given year), fiscal benefits will be allocated by the Ministry of Federal Planning to eligible projects and firms according to criteria that should prioritize (i) the promotion of small and medium-sized enterprises (SMEs), (ii) agricultural production, and (iii) regional economies (Biofuels Law, art. 14; Biofuels Decree, art. 18).

Facilities that are built to supply the domestic market and that seek fiscal benefits will need to satisfy the requirements set out in the Biofuels Law, such as being constituted by national or provincial governments, or private

⁶ Personal interview with Gustavo Bakovich (Director) Directorate of Biofuels – Secretary of Energy.

⁷ Personal interview with Gustavo Bakovich (Director) Directorate of Biofuels – Secretary of Energy.

entities dedicated "primarily" to agricultural production in Argentina (Biofuels Law, art. 13; Biofuels Decree, art. 19). Those that are awarded fiscal benefits will be required to sell their total production within the domestic market. Upon the existence of an excess supply of biofuels, the Secretary of Energy may authorize its export, and such exports are not eligible to receive the fiscal benefits afforded by the Biofuels Law (Biofuels Decree, art. 19(h)).

The projects selected by the Ministry of Federal Planning will receive the fiscal benefits contemplated in the provisions of Law 25.924 (2004) on Capital Investment Promotion and its complementary regulations, as well as exemptions on fuel taxes and those taxes that may complement or replace these in the future (Biofuel Law, art. 15; Biofuels Decree, art. 20). Further, a recent Secretary of Energy Resolution 1293/2008 (on the mechanism for selection, approval and priorities for bioethanol production projects under the promotional regime), establishes that the Secretary of Energy will establish a list of projects to be beneficiaries of the fiscal promotion regulations, according to a set of priorities set out in this norm, *ad referendum* of the Minister of Federal Planning. The latter has the discretion to alter such list of projects. Twenty percent of demand will be reserved to projects that benefit regional economies, in accordance with the priorities listed under the resolution including granting preference to SMEs and agricultural producers.

The Capital Investments Promotion Law creates a temporary investment promotion regime, the duration of which is currently being extended by the National Congress, aimed to promote the acquisition of capital goods and private investment in infrastructure (art. 1). The Ministry of Economy is the authority that allocates fiscal benefits to beneficiaries pursuant to a public contest. The fiscal benefits provided by the Capital Investments Promotion Law are the following: (i) the anticipated devolution of Value Added Tax (VAT) (art. 4), which reimburses beneficiaries of the regime the VAT paid (mostly a 10.5 percent *ad valorem* rate) when buying or producing capital goods; and (ii) the accelerated amortization of capital goods (art. 5), which allows regime beneficiaries who bought capital goods or own new infrastructure to shorten the accounting maturity of the investments made (in the range of 30–50 percent) with the effect of reducing the income tax paid in the years after investing. Additional fiscal benefits awarded to project beneficiaries within the Biofuels Law include a three-year exception to the presumed minimum income tax, established by Law 25.063 (1998) on tributary reform, for goods affected to the project. This entails an exemption

from the one percent annual tax on assets that the law defines as presumed minimum income generated by firms.

The Biofuels Law also provides beneficiaries with: (i) an exemption from the tax on liquid and gas fuels (Law 23.966 (1991) on Liquid fuels and Natural Gas tax, and related norms), which imposes an *ad valorem* rate of 62 percent on sales of gasoline and 19 percent on sales of diesel; (ii) an exemption from the gasoil tax set out in Law 26.028 (2005), which imposes an *ad valorem* rate of 20.2 percent on the sale of diesel; and (iii) an exemption from the hydric tax set out in Law 26.181 (2006), which imposes an *ad valorem* rate of 5 percent on the sale of gasoline, and 9 percent on the sale of natural gas.

In addition, Decree 1396/2001 on a competitiveness plan for biodiesel (*Plan de competitividad para el combustible biodiesel*), which was adopted prior to the Biofuels Law, had established several fiscal benefits applicable to biofuel production and distribution in general (i.e. without restricting them to specific project beneficiaries as the Biofuels Law does). It is unclear how these benefits will function once biofuels start to be sold on the domestic market, as this decree – if implemented by authorities – would benefit those domestic biofuel suppliers that are not beneficiaries of the Biofuels Law. These benefits apply to biofuels (or the relevant percentage within a blend of fuels) sold in the domestic market, exempting them from: (i) the tax applicable to all liquid and gas fuels until the year 2011, and (ii) the presumed minimum income tax, as long as the provinces where the facilities producing the fuel are located adopt legislation exempting biodiesel firms from relevant provincial taxes, such as gross income or sales taxes, hallmarks tax, and real estate taxes for the location of the facilities. In this way, the law seeks to encourage provinces to adopt fiscal benefits for biodiesel plants. The Santa Fe Province, for example, has enacted the above-mentioned Law 12.692 (2006) on a Promotional Regime for Non-conventional Renewable Energies and its regulatory Decree 158/2007 exempting bioenergy facilities from provincial taxes (gross income, hallmarks tax, real estate taxes, and vehicle taxes) for fifteen years since the start up of the projects.

Finally, Law 26.190 (2007) establishing a Promotional Regime for Renewable Energy used for Electric Generation grants fiscal benefits until 2016 to power plants using renewable energy sources (including biomass and biogas from facilities that do not fall under the Biofuels Law) awarding them similar benefits to the Biofuels Law, namely: the benefits provided in Law 25.924 on Capital Investment Promotion and its complementary regulations, for the

acquisition of capital goods or investments in infrastructure; and a three-year exemption from the presumed minimum income tax for goods affected to the activities promoted in this law (art. 9). It also establishes that a specific Trust Fund for Renewable Energies (*Fondo Fiduciario de Energías Renovables*) to be managed by the Federal Council on Electric Energy, will receive levies of up to 0.3\$/MWh collected by the Secretary of Energy to provide a subsidy of up to US\$ 1.50⁸ per kilowatt/hour to those plants that are not beneficiaries under the Biofuels Law and shall authorize the use of biofuels to supply the wholesale electricity market or public utilities.

One of the salient characteristics of the Biofuels Law is that it seeks to promote the development of the biofuel industry only for the purposes of domestic consumption. It also leaves a large margin of discretion to the Executive Power, as firms receiving benefits are selected by the government and are forced to sell their total production in the domestic market at a price set by the government.

Considering that the mandatory blending requirements will commence within two years but the government has not yet defined the price for the biodiesel, and also taking into account the significant oscillation in prices of commodities used to manufacture biofuels (such as soybean oil), it is practically impossible for a firm to prepare a business strategy based on the promotional regime established in the Biofuels Law. The production costs of biodiesel, for example, are in great measure determined by the international price of its main input, soybean oil, minus export taxes.

It thus seems that the Biofuels Law, in trying to create mechanisms to serve the domestic market, generates some uncertainties. Although flexibility is a crucial element of blending requirements and price-setting, the reverse side of the coin is that the Secretary of Energy's empowerment to change the required blending percentages without prior notice, as well as to fix the price of biofuels in the domestic market for those facilities taking advantage of fiscal benefits, may in fact create a barrier to investment in bioenergy for the domestic market by creating a sense of unpredictability or instability.

It is therefore likely that the Biofuels Law will promote some local projects, but fall short of its objective of promoting the creation of a sustainable domestic market for biofuels (with a reliable supply at competitive prices). In

⁸ Equivalent to US\$ 0.004 kW/h.

fact, the attempt to establish minimum blending requirements may fail if the fiscal incentives contained in the law do not achieve the objective of increasing domestic production oriented towards supplying the domestic market, as firms investing in this field may continue to choose export markets rather than participation in the domestic market. In this case, it is likely that the government may influence private sector decisions by increasing export taxes (which will be discussed in the next section) to make domestic biofuel market prices more attractive.

The fiscal benefits set up by the Biofuels Law also seem to contain a high degree of discretion. The example of the fiscal benefits provided by the 2007 Promotional Regime for Renewable Energy used for Electric Generation elucidates that a simpler design may result in a more effective approach, as it provides an equitable and predictable system that applies to all firms selling biofuels to the domestic electricity market without imposing fixed prices or mandatory procurement from specific beneficiaries unconnected with clear social or environmental objectives.

*Promotion of small and medium-sized enterprises
and agricultural development*

According to the Biofuels Law, the Ministry of Federal Planning should prioritize the promotion of small and medium-sized enterprises, agricultural production and regional economies in allocating fiscal benefits. The Biofuels Decree also stipulates that benefits granted to SMEs should seek to ensure their participation in satisfying 20 percent of the total biofuel demand (art. 14). However, dependence on raw materials subject to international commodity prices (like soybean oil) as well as pending administrative decisions on the price for biodiesel in the domestic market and the allocation of fiscal incentives, place SMEs in a very weak position to enter the biofuels market.

The current, more favourable export tax treatment of biofuels (see section 2.3.1) also fails to benefit agricultural producers because price differentials (and therefore profits), are fully absorbed by the biodiesel and vegetable oil industry. At this stage the volume of biodiesel exports in Argentina is not large enough to affect domestic soybean prices, therefore the government promotion policy has no effect on the income of agricultural producers.

It is clear, however, that farmers do benefit from the high soy prices and the immense areas dedicated to soy production across the country provide evidence of this. But the structure of soy production (requiring comparatively minimal labour), tends to favour concentration of land into the hands of few landowners and minimize possible positive impacts for the rural poor. Moreover, even if the increasing demand for biofuels resulted in a rise in the prices for soybean, the Argentinean Government's export taxes are likely to be adjusted to capture the increased profit margins.

Even though it is too early to judge the impact of the Biofuels Law, given the fact that it has not yet been fully implemented, it is likely that its impact on the domestic market will be more limited than originally envisaged. As the promotional regime provides only fiscal benefits for biofuel production, SMEs may have trouble entering the market due to the fact that their primary need would be to access credit to build plants, and also because government allocation of fiscal benefits may prove to be quite unpredictable.

Quality standards

The Secretary of Energy approves and sets out the technical specifications for all new fuel blends (Biofuels Decree, art. 10), and for all biodiesel-related facilities (Biofuels Law, art. 6). Products currently approved for sale in the country include "B5" (diesel with 5 percent biodiesel), "B100" (100 percent biodiesel), "E5" (gasoline with 5 percent bioethanol) and "E100" (100 percent bioethanol). Quality requirements for fuels sold in the domestic market, including biodiesel, were adopted in Secretary of Energy Resolution 1283/2006 on specifications for fuels sold for consumption within the national territory. These specifications are similar to those adopted by countries in the European Union (standard EN 14214) except for the iodine value that is adapted to soy characteristics. In addition, a National Programme for Fuel Quality Control, Inspection and Research and Development, in charge of controlling the quality of fuel sold at pumps, was created by Secretary of Energy Resolution 217/2001 and placed under the aegis of the Subsecretary of Fuels. The most recent bioethanol quality requirements were established through Secretary of Energy Resolution 1295/2008.

Public information and stakeholder participation

The Biofuels Law states that the Secretary of Energy should maintain an updated public registry of permits awarded to biofuel production and

processing plants, as well as an online list of those firms that receive promotional benefits. In addition, reference prices for biofuels shall be published, providing an annual estimate of the total volume of biofuels required to meet domestic market needs (art. 4). As the fiscal promotion regime has not started yet, the information prescribed by the law is not yet available online. Regarding stakeholder participation, the Biofuels Law, in line with Argentina's energy legislation in general, does not contain any formalized procedures for stakeholder participation in decision-making processes. The Biofuels Advisory Board, for example, does not conduct public meetings, have a website, or publish minutes of its meetings. However, as both the agricultural and oil and gas lobbies are very strong in Argentina, stakeholders belonging to these sectors meet regularly with authorities and negotiate or present their views on issues such as export taxes and fuel prices.

Communities' participation in decision making at the local level varies throughout the country, as they depend on provincial regulations to provide such mechanisms. In general, participation in decision-making on issues such as land use choices and the building of industrial plants is weak, although legal recourses exist for citizens to appeal to decisions taken by authorities in order to defend environmental rights (see section 2.5 below).

2.3 Rules promoting international trade

As described in the previous section, the specific legislation on biofuels adopted in 2006 has focused on creating a domestic demand through regulation and promoting a domestic supply of biofuels through fiscal incentives. The legal framework, however, has been more effective in promoting biodiesel exports and the building of biodiesel facilities by setting lower export taxes for this product.

2.3.1 Export taxes

There are hardly any agricultural subsidies in Argentina. On the contrary, the federal government imposes export taxes (*retencione*) to agricultural exports with the objective of hedging the domestic food prices from increases in international commodity prices and obtaining fiscal revenues. In this sense, Argentina's position as a net food and oil exporter allows the government more flexibility in controlling consumer prices for food and oil. The government may guide exports towards different products also by

establishing different *ad valorem* export tax rates, promoting, for example, manufactured products rather than exports of primary products. A clear example of tariff differentials is found in the soybean chain, where, according to Decree 310/2002 on export taxes soybeans are subject to a 35 percent export tax, and soybean oil to a 32 percent export tax. Export taxes on sugar cane are 5 percent.⁹ At the same time, Ministry of Economy Resolution 126/2008 sets a fixed biodiesel export tax at 20 percent. This differential compensates for the additional costs of producing biodiesel. Furthermore, considering that the international market prices for both soybean oil and biodiesel are similar, biodiesel production is more profitable than vegetable oil for exporting companies.¹⁰

Export taxes on regular gasoline and diesel, on the other hand, are regulated by Ministry of Economy Resolution 394/07 (Annex), which places a ceiling on the net income by oil companies at a maximum of US\$ 42 per barrel, and awards price differentials to the government through export taxes. Export taxes, thus vary according to international oil prices (currently over 45 percent), and are likely to continue being incremented to isolate the local market from fuel price increases in the international market. Export tax for biodiesel was raised to 20 percent in 2008.

Favourable export tax rates and international prices for biodiesel are driving the current interest in the export of biodiesel from Argentina. However controversial and unpopular with the exporting sector, and farmers in general, export taxes have proven to be useful market instruments to prevent the rise in prices of certain commodities like soy or corn – and fuels – from impacting the domestic market and increasing local food prices. As Argentina is a net producer of food and fuels, export taxes allow the government to keep food prices and industrial costs at bay, albeit at the cost of discouraging investments and reducing growth perspectives for the energy and agricultural sectors.

2.3.2 Requirements by export markets

Argentina's prospects for exporting ethanol are not as good as those for biodiesel. One of the reasons for this is that ethanol exports are affected by

⁹ For an updated list of tariffs see www.afip.gov.ar.

¹⁰ Ibid.

import tariffs imposed by the United States and the European Union, who are the main buyers.¹¹

Additionally, the biodiesel industry in Argentina is wary of new environmental requirements contemplated by the European Union for its member states to implement a 10 percent target for "sustainable" biofuels in overall petrol and diesel consumption by 2020. The details of the scheme are contained in the new European Directive on the promotion of the use of energy from renewable sources, adopted in 2009 as a part of a comprehensive post-2012 package on climate change and energy. In accordance with this EU Directive, sustainability will be defined according to minimum criteria, including that greenhouse gas emission savings from biofuels must be at least 35 percent, and that biofuels and bioliquids must not be made from raw material obtained from land with high biodiversity value or high carbon stock.¹² Most of Argentina's production should be in line with these requirements, and may in fact benefit from a shift away from palm oil.

Biodiesel is also affected by a non-tariff barrier stemming from a technical requirement by the European Union concerning the maximum iodine content in the fuel (contained in standard EN 14214), which is defined according to the iodine content of biofuel produced from rapeseed (*colza*) against that produced from soybeans. Biodiesel from soy is thus blended with that from rapeseed or palm (usually in the US) to reduce the iodine content prior to re-export to most countries in Europe. Spain, on the other hand, has increased the level of allowed iodine content to facilitate the import of soybean biodiesel (maximum iodine value for soy is 135 in Spain compared with 120 in the European standard).

It will thus be important for Argentinean authorities to maintain active participation in relevant international negotiations, including through consultations between Mercosur and the EU, to prevent the establishment of costly bureaucratic procedures or certification schemes that may violate WTO rules. A Mercosur group on biofuels was created in December 2006 to present a common regional strategy towards export markets regarding tariff and non-tariff barriers to trade. Participation in WTO meetings on environmental goods and services (where the issue of reducing tariffs for biofuels was presented by Brazil) has, however, not yet been approached as a regional strategy.

¹¹ Both the EU and the US place a tariff of over US\$ 0.50 per gallon (3.78 litres) of ethanol.

¹² See www.ec.europa.eu.

2.4 Environmental legislation

Legislation related to environmental requirements and standards emanates from different legal instruments, and applies both to facilities that produce biofuels and to agricultural producers growing biofuel crops. As the regulation and management of natural resources is a competence that falls primarily upon provincial governments, legislation in this regard is not uniform throughout the country. The following sections will address those regulations that are of a federal nature, including: the environmental requirements in the Biofuels Law; the minimum standards of environmental protection adopted by the federal government; and regulations related to CDM projects.

2.4.1 Environmental requirements in the Biofuels Law

Facilities producing biofuels are subject to similar environmental requirements as any industrial production facility in Argentina, namely obtaining a permit by the relevant provincial authority in accordance with provincial legislation. Prior to awarding permits to biofuel production facilities, the Biofuels Law requires the Secretary of Energy to ensure compliance with relevant quality standards for biofuels and its sustainable production. Each facility is requested to present an environmental impact assessment including information on the treatment of effluents and waste management (art. 6). In practice, however, the Secretary of Energy requires projects and facilities to present the permits awarded by provinces where facilities will be located. Such permits are considered proof of compliance with environmental norms. Therefore, as this regulation occurs on a province level there is currently no overall evaluation at national level of compliance with specific environmental standards.

2.4.2 Environmental requirements concerning agricultural production

Argentina's environmental legislation applicable to the agricultural sector (water and soil protection, environmental impact assessment and biodiversity protection) is under provincial jurisdiction, thus varying throughout the country. As a general rule, agricultural production is mostly an unregulated sector with respect to environmental protection. An environmental impact assessment is not required for regular agricultural activities, although some provinces have specific requirements to issue deforestation permits that include environmental impact assessments and public participation instances.

Even though some legislation, such as the preambular paragraphs to the Biofuels Decree, make reference to the positive impact of biofuels on the environment, no specific standards to evaluate the environmental sustainability of this industry have been designed in Argentina. Research on the sustainability of biofuels produced in Argentina, taking into account the local conditions for their production and their environmental impacts, is still ongoing. In addition, international studies on the impacts of biofuels on greenhouse gas emissions may not necessarily reflect the situation in Argentina, as soy cultivation in the country has specific characteristics: for example, it generates additional emissions from nitrous oxide, while simultaneously reducing other greenhouse gas emissions through the use of no-tillage farming methods.

In the case of agriculture and specifically on issues related to land use and land use change, including forestry, national environmental legislation tends to be limited to the adoption of international treaties and programmes to further their objectives, and the adoption of general environmental legal principles, such as those included in Law 25.675 of 2002 on general environmental criteria (*Ley General del Ambiente*).¹³ These laws and regulations do not have a direct impact, however, on land use choices and therefore on the production of crops for biofuels.

Provinces do not normally have land use planning strategies but leave it to the landowners to decide whether to maintain forest cover or deforest the land. The absence of a serious land use planning strategy, coupled with ongoing agricultural development, has led, during the past 17 years, to the loss of 5 million hectares of native forests and the degradation of many areas.¹⁴ The increase in the area dedicated to the cultivation of soy has also raised serious concerns over the loss of biodiversity in some areas through the conversion of natural pastures previously devoted to livestock raising, the draining of wetlands for agricultural production and the destruction of native forests.¹⁵

In response to these concerns, and to an active civil society campaign led by Greenpeace, the National Congress started discussing minimum environmental standards for the protection of native forests, which led to the adoption in November 2007 of Law 26.331 on Minimum Standards of Protection for Native Forests (the Native Forests Law). The Native Forests

¹³ See www.ambiente.gov.ar.

¹⁴ Ministry of Environment, Sustainable Development Indicators System, December 2006.

¹⁵ Greenpeace, 2007

Law introduced a novel approach towards federal regulation of natural resources, by requesting all provinces to adopt a land use planning strategy for native forests during 2008, through a participatory process and considering sustainability criteria included in the law's Annex in order to establish different zones where native forest cover should be kept intact. Provinces that fail to adopt such strategies should refrain from issuing any further deforestation permits (arts. 6 and 7). The Native Forests Law also establishes that all deforestation of native forests will require a permit by local authorities, granted in addition to an environmental impact assessment and following public participation procedures (arts. 13, 22 and 26). It further establishes the minimum requirements that such environmental impact assessments and public participation procedures should incorporate. Decree 91/2009 (on the regulation to the Native Forests Law No. 26.331) is the implementing instrument of this law and creates a National Fund for the Conservation and Enrichment of Native Forests.

2.4.3 CDM in Argentina

According to the Biofuels Law, projects receiving fiscal benefits may also qualify for the Clean Development Mechanism under the Kyoto Protocol's CDM (art. 17). The Secretary of Environment should advise potential beneficiaries on the conditions, programmes and benefits that may be obtained through biofuel activities in the CDM (Biofuels Decree, art. 21).

The Secretary of Environment was designated in Decree 2213/2002 as the implementing authority for the UN Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol. Secretary of Environment Resolution 240/2005 then replaced the former Argentine Office for Joint Implementation created by Decree 822/1998 with the Argentine Office for the Clean Development Mechanism (*Oficina Argentina del Mecanismo para un Desarrollo Limpio*), which is the Designated National Authority for the CDM. As such, it is in charge of evaluating CDM projects prior to their submission to the UNFCCC. The Argentine CDM Office is comprised of: a Permanent Secretary; an Executive Committee with representatives from the Secretary of Energy, Secretary of Agriculture, Secretary of Industry, Commerce and Mining, Secretary of Transport, Ministry of Economy, Ministry of Foreign Relations, International Trade and Worship, and Ministry of Science; and an Advisory Committee. The procedures for the evaluation of projects presented to the Argentine Office for the CDM for approval are set out in the Annex to Secretary of Environment Resolution 825/2004 on procedures

for the national evaluation of projects presented to the Argentine CDM Office. A voluntary mechanism for prior consultation is set out in Secretary of Environment Resolution 239/2004.

A project's approval by the Argentine CDM office follows an evaluation of compliance of project documentation with CDM requirements and national legislation, performed by the Permanent Secretary (Annex clauses 4 and 6), and a technical evaluation performed by the Executive Committee, considering relevant opinions presented by provincial authorities and a technical assessment institution (Annex clause 7). Projects that are approved by the Secretary of Environment, upon consideration of the decision by the Executive Committee, are issued a Designated National Authority Approval Letter that confirms that the project contributes to the country's sustainable development and the UNFCCC objectives (Annex clause 10). This enables project proponents to present their projects for validation and further registration by the CDM.

These resolutions do not set fixed priorities for determining a project's contribution to sustainable development, although these are under consideration by the Argentine CDM Office. A reader-friendly description of the prior consultation mechanism, including relevant documents is available on the Argentine CDM Office's website. The Secretary of Environment has also published a Manual for the development of CDM projects¹⁶ that provides additional details about methodologies and requirements for project presentations. Annex 2 to the Manual is updated regularly to include new CDM methodologies, and currently includes electricity generation projects from biomass waste. Another relevant publication by the Secretary of Environment is a paper on financial and legal issues to consider in the development of CDM projects.¹⁷

A list of all projects presented for consideration by the Argentine CDM Office, including project design documents (PDDs) and their current status is available online.¹⁸ Argentina has ten projects registered by the CDM Executive Board, three of which relate to bioenergy:

- Project 0876: Partial substitution of fossil fuels with biomass in cement manufacture (registered on 14 September 2007);

¹⁶ See www.ambiente.gov.ar.

¹⁷ See www.aplicaciones.medioambiente.gov.ar.

¹⁸ See www.ambiente.gov.ar.

- Project 0928: Methane recovery and effective use of power generation project Norte III-B Landfill (registered on 27 April 2007); and
- Project 0950: Bioenergy in General Deheza –Electricity generation based on peanut hull and sunflower husk (registered on 9 April 2007).

According to online information provided by the UNFCCC, the expected average annual certified emission reductions (CERs) that will be contributed by projects in Argentina amount to 2.04 percent of the total contribution by all CDM registered projects (calculated to reduce 189 201 382 tonnes of carbon dioxide equivalent per year through 901 projects). Argentina's participation in the CDM is still limited, when compared with the whole of Latin America and the Caribbean region that has registered 301 projects (most are located in Brazil and Mexico).

2.5 Labour laws and social guarantees

Most of the population involved in bioenergy production in Argentina is rural, as both agricultural inputs and main biofuel facilities are located in rural areas. Argentina's rural population is characterized by its difficulty to access health services, lack of adequate housing or sanitation and low awareness of occupational health risks, as well as by the use of inadequate equipment and safety procedures. It is not unusual for families to participate in agricultural activities, and thus for women and children to be exposed to pesticides and other agriculture-related risks. These risks vary according to agricultural practices used and chemical products applied to crops. Glyphosate, the main herbicide applied to soybean production in Argentina, is classified by the World Health Organization as Class U (unlikely to present acute hazard in normal use), therefore the persons interviewed for the purposes of this study did not see bioenergy production as creating additional occupational health risks compared with agricultural production in general, but rather, minimizing them. However, that conclusion is a broad generalisation and an analysis of risks will necessarily need to consider products being used, the capacity of the workers to understand and incorporate safety procedures and the provision of adequate training and equipment by employers.

The main legislation applicable to agricultural worker's safety in Argentina can be considered adequate to protect workers if its provisions are complied with. It includes: Law 19.587 (1972) on Hygiene and Safety at Work, Law 24.557 on Labour Risks (1995), Law 22.248 (1980) on Agricultural

Work, and Decree 617/1997 on hygiene and safety in agricultural activities. Argentina's legislation on worker's safety is set as a federal standard requiring the use of appropriate equipment, and provision of training and medical advice for workers engaged in the handling of toxic substances. The competent authorities for regulation and control are the Ministry of Labour and the Superintendent for Labour Risks, in addition to relevant provincial authorities.

Regarding the impact of biodiesel promotion policy on rural development, studies are not available, but most experts contend that biodiesel production is unlikely to alter or produce any significant impact on existing patterns of agricultural production. In any case, in a country as vast as Argentina, the social effects are to be studied at the local level as regional realities vary widely, and will mostly depend on whether the local population is engaged within the soy production chain. Negative impacts may be found in regions where soy monoculture displaces traditional livestock farming practices, for example, in cases where local populations, or indigenous communities, depend on cattle grazing land that falls under the legal title of other people. The effect of biofuels on global market prices for commodities like soy may increase landowners' incomes and reduce farmers' market risks. Given Argentina's land tenure structure for soy production (composed mainly by large mechanized farms), biofuels are unlikely to alter rural poverty levels or farm workers' livelihoods. However, positive impacts could result from alternative crops (such as jatropha) being grown for biofuel production in current dryland areas with high levels of poverty.¹⁹

Regarding the possibility for communities to have a say in the approval of bioenergy projects that may affect the environment, local legislation may provide for public participation (as is the case concerning the consideration of deforestation permits). In all cases, however, affected parties and community representatives may present an *amparo* procedure to protect their constitutional right to a healthy environment. The 1994 reform to the Argentine Constitution in fact empowered local communities and non-governmental organizations to request a preliminary measure to stop any project, which violates or threatens to violate collective environmental rights (art. 43), including the right to a "healthy and balanced environment" (art. 41).

¹⁹ FAO, 2007.

This summary *amparo* procedure against "any form of discrimination and about rights protecting the environment, competition, users and consumers, as well as about rights of general public interest," may be filed by the affected party, the ombudsman and the associations that foster such interests (art. 43).²⁰ The 1994 constitutional reform has thus allowed affected parties, environmental associations and the ombudsman to have standing in court to represent environmental interests, and provides them with a powerful legal instrument to protect environmental rights. The *amparo* procedure works in a similar way to a *habeas corpus*, which is a summary procedure to protect the right to freedom used to prevent illegal detentions. Instead of guaranteeing solely individual freedom, the *amparo* procedure is geared towards guaranteeing the exercise of constitutional rights in general. This allows judges to expeditiously examine the constitutionality of decisions, regulations or acts of public or private parties that affect constitutional rights and ensure that decisions are not delayed by bureaucratic or judicial barriers.²¹

3. NATIONAL BIOENERGY POLICY AND ITS IMPACT

Argentina incorporated policy goals in several laws and regulations that provide insight into decision-makers' expectations on the future of the bioenergy sector, although it does not yet have a unified instrument spelling out bioenergy policy at the national level.

The guiding principle for the approach of the federal government towards fuel production is related to energy security, and is described in the Fossil Fuels Law (art. 2.2.1), which states that the federal government will determine the national policy for activities related to the exploitation, industrialization, transport, and commercialization of fuels, *with the overarching objective of satisfying national fuel needs with domestic production* (emphasis added) in articles 2 and 3.

The guiding principle regarding agricultural production is not as clearly stated in a legal instrument, although agricultural policy in Argentina tends to follow market opportunities and promote research in products considered to have international trade or value-added potential. Along these lines, Argentina is focusing on promoting the production of biodiesel from soy and ethanol from sugar cane, with research being carried out on alternative biofuel crops.

²⁰ An English translation of the Argentine National Constitution can be found at www.senado.gov.ar.

²¹ Aguilar, S. 2002.

Bioenergy policy in Argentina therefore shifts between these two overarching policy objectives: satisfying domestic fuel needs and promoting an export-oriented agricultural industry. The Preamble to the Biodiesels Decree, one of the sole instruments stating bioenergy policy objectives, stipulates that: the diversification of the fuel offer constitutes one of the pillars of national fuel policy; the incorporation of biofuels in the national energy matrix is based on the need to promote the use of fuels with the least compromise on the environment, in accordance to Article 41 of the National Constitution (right to a healthy and balanced environment); the development of the biofuels business chain must be promoted; and the promotion of biofuels is an adequate policy to confront the challenges of preventing shortages in a growing economy. The only quantitative policy goal adopted at the national level related to bioenergy is the target to achieve a 8 percent share of renewable energy in the national energy consumption matrix by 2018, included in Law 26.190 of 2007 on a Promotion Regime for the Use of Renewable Sources of Energy for Electricity Generation (art. 2) and is based on the target for renewable sources of energy adopted at the 2004 Bonn Conference on Renewable Energies. Currently the only concrete measures to achieve this goal are those deriving from the mandatory 5 percent blending requirement for biofuels in the transport sector from 2010 onwards.

At the regional level, the Regional Conference on Renewable Energies for Latin America and the Caribbean (Brasilia, October 2003), adopted in 2003 the "Brasilia Platform on Renewable Energies" to reach by 2010 an average of at least 10 percent share of renewable energy sources in the region. Within Mercosur, Decision CMC 49/07 and its Annex establish a working group on biofuels and adopt an action plan that aims to exchange information, foster cooperation, and coordinate positions of the member states on negotiations regarding the adoption of global quality standards for biofuels.

Several policy initiatives have also been launched at the ministerial level. The Secretary of Agriculture under the Ministry of Economy was the first to address biofuels with a National Programme on Biofuels adopted through Secretary of Agriculture Resolution 1156/2004 that focuses on crop diversification (looking for alternative crops with better energy balance than soy) and promoting regional development. The programme evaluates crops like jatropha, rapeseed (*colza*) and castor oil plant (*ricino*) and has yielded good preliminary results. The research of the National Institute of Agricultural Technology (INTA), with the support of the Food and Agriculture

Organization of the United Nations (FAO) is also mapping Argentina's biofuel potential for domestic consumption by identifying the richest biomass-resource sites and main energy consumption centres.²² Funds for the biofuels programme are however limited, thus the capacity to implement the programme beyond pilot projects is constrained.

In the Secretary of Environment, the focus of policy-making is on promoting CDM projects under the Kyoto Protocol. Thus, a National Programme on Energy and Fuels was created through Secretary of Environmental Policy and Planning Disposition 166/2001, and a specific National Biofuel Programme created through Secretary of Environment Resolution 1076/2001. Both are mainly tasked with coordinating research programmes and studies to enhance the use of international climate policy instruments in the promotion of sustainable energy sources. The biofuels programme, adopted by the Secretary of Environment, also contemplated the development of environmental and sustainable development indicators for biofuels use in the country, although these have not been developed. Most sources consulted agree that the Secretary of Environment has an active CDM office, but has not made a substantive contribution to the development of national bioenergy policy.

Regarding environmental objectives, policy measures and their implementation through legislation have not been preceded by a study on Argentina's agricultural production scheme and ecosystems, to compare crops according to their energy and greenhouse gas balance, in order to ensure an efficient approach to crop promotion in environmental terms. Experts coincide, for example, in pointing out that Argentina is reaching its maximum capacity in terms of lands devoted to soy production (more than 16 million hectares), thereby possibly creating environmental risks if the agricultural frontier continues to expand into native forests and other sensitive ecosystems like wetlands.

Regarding research and development policy, the Ministry of Science and research institutes have public and private-funded research programmes focusing on bioenergy inputs. Private firms, especially vegetable oil conglomerates and the oil and gas industry maintain research groups on key areas of biofuel production. On biofuel inputs, public institutions working on biofuel research and development include the development of biogas

²² The project uses FAO's Woodfuel Integrated Supply-demand Overview Mapping (WISDOM) system.

digesters by INTA and lignin biodegradation by the National University of Tucuman. On processes, Salta University is conducting research and development on processes for biodiesel production with enzymes and the University of Buenos Aires is working on the design, modelling and optimization of chemical processes for biofuel production. In terms of applications, the *Universidad Nacional del Litoral* is evaluating quality control for fuels according to national and international standards, and the National Technological University on emissions by alternative fuels in combustion engines.²³

At the policy level, Argentina's current focus on short-term energy security lacks a strategic approach to reliable and sustainable energy sources of the future, such as wind-power, tidal or biofuel sources. The country's institutions and private sector lack clear policy guidance on the path to be followed in terms of bioenergy production, or renewable energy as a whole, and one effect of this is that investment is curtailed in this field. Argentina's energy policy thus seems to be reactive rather than proactive. Unlike its neighbour, Brazil, which has implemented a decades-long programme on ethanol and invested in off-shore explorations that resulted in the discovery of large reserves of oil and gas, Argentina does not currently have a long-term perspective in its energy policy.

4. CONCLUSIONS

Argentina's main legal instrument affecting the development of the biofuels industry is at present an export tax differential favouring biodiesel against the export of the main alternative inputs (soybeans and soybean oil). The country's low production costs coupled with the tax differential have allowed the development of a new industry with the capacity to export 1.5 million tonnes of biodiesel per year. Export taxes are also used as a means to control domestic food and fuel prices from increasing, as Argentina is a net food and fuel exporter. Although export taxes in general are controversial as they tend to discourage investment in exporting industries, and 2008 increases in such taxes have led to a major farmers' strike, the establishment of differential export taxes have promoted an export-oriented biofuel industry and protect consumer prices (especially of food) from rising.

²³ FAO, 2007.

As yet, some of the gains envisaged in the Biofuels Law and several other promotional regimes, geared towards the creation of a domestic biofuels market through the provision of fiscal incentives, are yet to materialize. Investors and stakeholders await with mixed predictions the entry into force of a 5 percent mandatory blending requirement for diesel and gasoline in the domestic market by 2010.

The legal regime applying to biofuels production for the domestic market is characterized by the promotional nature of its provisions for this sector. The very elaborate framework of fiscal incentives, this may lead to the danger of a lack of coherence among different laws establishing favourable financial benefits. Also, a marked focus is visible on the fuel (downstream) aspects of biofuel production rather than on its agricultural phases. While some social and environmental guarantees can be seen in the biofuels legislation, particularly with respect to small and medium-sized agricultural enterprises, it is likely that reliance will have to be placed on the broader legal framework for greater social and environmental protection. Land use planning falls under provincial jurisdiction but is not implemented, although a minimum standard of protection for native forests has recently been adopted at the national level. Its results and impacts on biofuels production are yet to be seen.

Key components in the Biofuels Law are still pending further elaboration. In particular, definitions on key issues such as the formula that will guide biofuel prices once the regime is put in place are still absent as is the criteria to allocate fiscal benefits. Concerns related to excessively broad discretion on both accounts have also been underscored. Currently, the Biofuels regime establishes that biofuel prices in the domestic market will be set by the Implementing Authority, but does not give any indication of the parameters that will be used to determine such a price.

Even though the biofuels regime presents an adequate institutional set up, clearly allocates tasks to different government agencies, and includes provisions on institutional coordination through the National Advisory Commission on Biofuels, a common concern expressed by different stakeholders is the lack of transparency in decision-making by authorities. This could be resolved within the existing legal framework by complying with the public information requirements set out in the Biofuels Law and improving the visibility and transparency of the work of the National Advisory Commission on Biofuels.

With reference to environmental aspects, even though the adoption of specific legislation on environmental impact assessment is under the jurisdiction of the different provinces, relevant national coordinating bodies may consider formulating minimum criteria for the sustainable production of biofuels (including the treatment of effluent and waste management), that facilities should satisfy when seeking fiscal benefits through the Biofuels Law.

In its current form, Argentina's bioenergy regime places a significant emphasis on fiscal benefits so it is necessary to rely on its broader network of social and environmental laws to ensure that the sustainability of bioenergy sector.

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B. BRAZIL

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1. INTRODUCTION

This chapter provides an overview of bioenergy and agricultural production in Brazil, and briefly reviews experiences in the biofuel industry since the 1970s. It outlines federal legislation and institutions governing this industry and highlights examples of interagency coordination. It then describes in further detail the regulations applicable to the bioethanol and biodiesel sectors, focusing on regulatory requirements, incentives and institutions in both fields, after which the discussion draws particular attention to the Social Fuel Seal mechanism. The last section reviews other legislation relevant for the sustainability of the biofuels programmes in Brazil, including its climate change plan, the Kyoto Protocol's Clean Development Mechanism (CDM) programme in Brazil, selected forestry legal requirements, ecological and agricultural zoning plans, environmental impact assessment regulations and new legislation applicable to land tenure in the Amazon. It also provides a brief overview of the main voluntary agreements addressing social and environmental conditions in the biofuels sector. The final section presents the conclusions of the study, identifies innovative legal options and provide some recommendations.

1.1 Overview of bioenergy and agricultural production in Brazil

Brazil is endowed with extensive agricultural resources and is a world leader in agricultural production. With 62 million hectares of cultivated land (out of a total 851 hectares, 400 million of which are protected areas, including the Amazon rainforest) dedicated to fruit, vegetable and cereal production, Brazil's croplands produced 135 million tons worth of agricultural products in 2008, and was the third largest global exporter of agricultural products, with exports totalling US\$ 71.8 billion. In the same year, agribusiness contributed 25 percent of Brazil's gross domestic product (GDP), employed 35 percent of the labour force, and accounted for 36 percent of total exports. Brazil is the world's leading producer of coffee, sugar and orange juice, and is also a major global producer and exporter of soybeans and cotton. Two of these, sugarcane and soybeans, are Brazil's primary bioenergy crops, with sugarcane bioethanol alone representing 16.4 percent of Brazil's total domestic energy supply.

Brazil's overall energy profile is quite green, with 45.3 percent of the energy supply coming from renewable energy sources in 2008. Additionally, Brazil has been close to achieving complete energy independence for the past few years through its combination of intensive renewable energy use and

increasing petroleum production capacity. Achieving energy independence has been a long-term goal of successive Brazilian governments since the first oil embargo of the Organization of the Petroleum Exporting Countries (OPEC) and resulting oil crisis of 1973. This led directly to the creation of the first Brazilian bioethanol programme *Pró-Álcool* (*Programma Nacional do Álcool*) in 1975, as an instrument to achieve the objective of energy independence by replacing petroleum imports with domestic transport fuel production.

Although domestic bioenergy consumption has gone through ups and downs since then, Brazil's current bioenergy programme is one of the most advanced in the world. This programme is characterized by a detailed tax exemptions regime, mandatory blending of 25 percent bioethanol with gasoline, and the most significant catalyst for current success – the introduction of flex-fuel automobiles in 2003 that can run on pure gasoline, pure bioethanol or any combination of the two. The availability of these new automobiles has galvanized domestic demand for sugarcane bioethanol, with more than 80 percent of vehicles sold in 2009 being flex-fuel. In the decade prior to the introduction of these vehicles, domestic consumption of bioethanol fluctuated between approximately 10.5 and 13.6 billion litres per year. In 2008, only five years after their placement on the market of these vehicles, domestic consumption rose to approximately 18.9 billion litres (out of a total production of 22.5 billion litres, with the remainder being exported).

A further benefit of Brazil's use of sugarcane for bioethanol production is the co-generation of electricity produced using plant residue, or bagasse, which accounts for 25–30 percent of plant weight. In most cases this process is sufficient to completely power bioethanol plants and in some cases, produces excess electricity that is sold to the national grid. Indeed, in 2008 an important part of the 4.1 percent of electricity in Brazil generated from biomass came from sugarcane bagasse.

Achieving near self-sufficiency in energy production has driven the Brazilian government to begin concentrating on other objectives for the bioenergy sector, with social and environmental sustainability goals being increasingly prioritized in recent years. The Brazilian Agroenergy Plan 2006–2011 outlines these new objectives, stating that Brazil's primary aim in this sector is to "produce and transfer knowledge and technologies that contribute to the sustainable production of energy from agriculture." The government has

created a number of specific goals in light of these new endeavours including efforts to: support movement towards a more sustainable and less greenhouse gas intensive energy matrix through bioenergy, provide increased and more equitable employment opportunities by decentralizing bioenergy production, and improve export opportunities for bioenergy products. The bioenergy plan focuses on four main products: bioethanol, biodiesel, planted energy forests (for charcoal), and residues from agriculture and forestry (including sugarcane bagasse).

Pre-empting the release of this national plan, but exemplifying its goals, is the National Programme for the Production and Use of Biodiesel's (PNPB) Social Fuel Seal (*Selo Combustível Social*) to be discussed in section 2.5.5 of this chapter. This social programme, which was initiated alongside the PNPB in 2005, provides incentives for large biodiesel producers to source from, and improve the livelihoods of, smallholders in economically sensitive regions. The primary feedstock for biodiesel in Brazil is soybean, which in June of 2009 accounted for 81 percent of Brazilian vegetable oil production. One of the PNPB's primary aims however, is to diversify biodiesel crops based on socio-ecological suitability as well as output potential. In 2008, over 1.2 billion litres of biodiesel were produced, nearly doubling the 736 000 in 2005. Additionally, with current production capacity being vastly higher than actual production, at about 3.7 billion litres, Brazil is well-positioned to continue increasing its production and consumption of biodiesel in the near future. Indeed, the drastic production increases since the PNPB's inception have seen the programme running ahead of schedule: thus, in Brazil's National Climate Change Plan of 2008, the original 5 percent blend mandated by 2013 was moved up to 2010, with the PNPB already boosting the interim blending mandate to 4 percent in July 2009.

This current stage of socially and environmentally conscious bioenergy production and consumption is seen as a positive example to which many nations currently aspire. To this end, Brazil is working bilaterally with a number of developing and developed countries through technical scientific exchanges, and promoting diversification of energy and research into improved production methods. Another initiative through a Mercosur group on biofuels created in December 2006 presents a common regional strategy towards export markets, and tariff and non-tariff barriers to trade. Furthermore, a Memorandum of Understanding with the United States was signed in order to promote greater cooperation on bioethanol and other biofuels by stimulating research and development; building domestic biofuels

industries in third countries; and working multilaterally to advance the global development of biofuels. Brazil is also a member of the Global Bioenergy Partnership sponsored by FAO and the International Biofuels Forum and has signed a host of bilateral cooperation agreements, for example with Mozambique and Sweden.

Taken together, Brazil's bioenergy policies over the years have contributed greatly to the current success of Brazilian sugarcane bioethanol production and the potential of its nascent biodiesel industry. While the government still plays an important role in this industry as detailed further in subsequent sections, Brazil runs one of the most 'hands-off' bioenergy programmes in terms of government intervention. The following discussion outlines the history of Brazil's bioethanol and biodiesel programmes, and thereafter presents the current legal and institutional framework for bioenergy in Brazil focusing on bioethanol and biodiesel legislation.

1.2 Creating a new market: a brief history of the National Alcohol Programme, *Pró-Álcool*

From 1975 to 2006, Brazil consumed over 275 billion litres of domestically produced bioethanol, saving over US\$ 69 billion worth of foreign exchange by avoiding the purchase of oil from abroad. The history of this massive endeavour can be broken down into four phases. The first (1975–1979) was predicated on the aforementioned desire to reduce dependence on foreign sources of fossil energy as a result of a balance of payments emergency created by the oil crisis of 1973, which led oil import costs spiking from approximately US\$ 500 million in 1972 to US\$ 2.8 billion in 1974. Aside from reducing this vulnerability, the formation of *Pró-Álcool* had another important objective – to stabilize domestic prices and demand for sugar, an industry that had previously been defendant on highly distorted and fluctuating international markets. For this purpose, a system of government subsidies and tax incentives was created for sugarcane producers and bioethanol distilleries.

The second phase (1979–1989), considered the peak of the *Pró-Álcool* years, began as oil prices jumped again in 1979 and oil imports skyrocketed to over US\$ 10 billion in that year, with Brazil becoming the most highly indebted developing nation in the world in absolute terms, by 1980. Brazil began more earnestly promoting sugarcane bioethanol production in 1979 by promoting federal support for alcohol production through the creation of

the National Alcohol Council (*Conselho Nacional do Álcool*) to provide oversight for *Pró-Álcool* and its implementing agency, the National Executive Commission for Alcohol (*Comissão Executiva Nacional do Álcool*). This new institutional structure, along with a series of new financial and tax incentives, led to the golden age for *Pró-Álcool* which by 1985, saw 96 percent of all automobiles sold in Brazil running on bioethanol, with over 4.5 million of these cars being sold by the end of the decade.

The programme used six primary mechanisms to promote bioethanol production and consumption during this time: (i) the requirement that bioethanol be priced lower than gasoline at the pump; (ii) a guaranteed even price across the nation for all bioethanol producers; (iii) tax incentives for bioethanol automobiles; (iv) loans to bioethanol producers for expanding capacity; (v) the obligation for gas stations to sell bioethanol; and (vi) the creation and maintenance of strategic bioethanol reserves. The National Petroleum Council (*Conselho Nacional de Petróleo*) was tasked with assuring bioethanol supply by establishing an adequate distribution infrastructure and fixing the price at which bioethanol was sold. These incentives were always meant to be temporary however, with high oil prices expected to ensure ever-increasing competitiveness for Brazil's bioethanol as compared to gasoline.

Oil prices fell however in 1986, and by 1989, the third deregulatory phase (1989–2000), of Brazil's modern bioethanol history had begun. The year 1989 marked the beginning of a precipitous drop in bioethanol production. Contributing factors included: rising global sugar prices, upward governmental bioethanol price adjustments compared with newly inexpensive gasoline, shifting tax incentives to promote new compact automobiles, and a lack of consumer confidence in the production of enough alcohol to continue fuelling a largely pure (hydrous) bioethanol powered fleet. Sales of the previously successful hydrous alcohol powered vehicles fell drastically and by 1996, were nearly nonexistent. In attempts to save the floundering industry, Law No. 8.723 on vehicle emission pollutants was passed in 1993, mandating that all gasoline sold must be blended with 20–25 percent (anhydrous) bioethanol. This law is still in effect and is analysed below. Furthermore, in the mid 1990s, as the Washington Consensus took hold in Latin America – a recipe for economic growth promoted by international finance institutions favouring tight budget controls, market liberalization, deregulation and privatization of national enterprises – induced a sweeping process of deregulation and privatization in

Brazil. Government control of bioethanol prices fell away along with most of the incentives that had previously promoted sugarcane bioethanol production; all subsidies were dismantled by 1997.

The fourth and current stage began in 2000. Bioethanol began to rebound as oil prices increased again around the turn of the millennium, combined with continually decreasing bioethanol prices primarily owing to efficiency gains in the newly liberalized sugar industry. The 33rd amendment to the Brazilian Constitution, passed in 2001, completed the deregulation process in the fossil fuel sector by relaxing the state's monopoly on the oil industry, and by removing the last subsidies and price controls for gasoline, diesel oil and liquid petroleum gas (LPG). As a result, the biofuels sector is currently market-oriented, with large national (and some international) firms leading developments in this field. In the present decade, consumption has spiked along with increased productivity, especially after the introduction of flex-fuel vehicles, which today make up 32 percent of the entire car and light commercial Brazilian vehicle fleet, and account for more than 80 percent of current vehicle sales only 7 years after their introduction. Today, the Brazilian government plays more of a supervisory role in this sector in comparison to its more interventionist origins. However, although more limited in its actions, the government still does play a very important role in keeping bioenergy alive in Brazil. How and why this occurs will be sketched out in the remaining sections of this chapter.

2. LEGAL AND INSTITUTIONAL FRAMEWORK FOR BIOENERGY IN BRAZIL

Brazil has a federal government structure comprised of 26 states and one federal district. The Constitution of 1988 as amended in 2005, reserves in Article 22 the exclusive right of the federal government to legislate on energy, international trade and transportation (unless specifically devolved through the creation of a supplementary law). Article 23 of the Constitution lists areas in which shared power is held amongst the federal government, states, the federal district, and the municipalities, namely to: protect the environment and to fight pollution in any of its forms; preserve forests, fauna and flora; promote agriculture, livestock and food supply; and fight the causes of poverty and the factors leading to substandard living conditions, and promoting the social integration of the unprivileged sectors of the population. Article 24 goes on to note however, that the power to legislate

on production and consumption, the preservation of nature and liability for damage to the environment are held concurrently by the federal government, the states and the federal district, with the role of the federal government being limited to the provision of general rules and that of the states to supplement them.

With the highly centralized role played by the federal government in commerce, energy and transport, most bioenergy policy prior to the turn of the century was considered to fall within the realm of federal responsibility. However, as bioenergy has become an ever-greater political hot-button issue of late, this has begun to change and states have become increasingly involved in the environmental regulation of bioenergy. Due to the complexity of Brazil's legal framework and regulations at the state and municipality levels, this study will be limited to federal regulations on bioenergy.

2.1 International agreements and initiatives relevant to bioenergy

Brazil is a party to the Convention on Biological Diversity and its Cartagena Protocol on Biosafety as well as the UN Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol. It is also a member of the World Trade Organization (WTO) since 1995.

Brazil is an active participant in the WTO's discussions on the Doha Round of Negotiations, and has proposed that biofuels be categorized as environmental goods for integration into the list of products to be liberalized within environmental goods and services negotiations. This proposal has support from several developing countries (Chile, Colombia, Egypt and South Africa) but faces serious opposition from developed countries (European Community, United States, Japan and Australia) who argue that biofuels should be dealt with under agriculture negotiations.

Brazil also plays an important role within climate change negotiations. It has put forward the so-called 'Brazilian Proposal' to take account of cumulative historical emissions for distributing the burden of emissions reductions among developed country parties. It was one of the original proponents of the Clean Development Mechanism during the Kyoto Protocol negotiations, and actively participates in current negotiations on a post-2012 climate regime.

2.2 Federal laws regulating the bioenergy market

A number of important federal laws have framed and continue to frame contemporary bioenergy production and consumption in Brazil, most notably Law No. 9.478 (1997 as amended) on the National Energy Policy. The National Energy Policy Law sets out as one of its main objectives the increase of the contribution of biofuels to the national energy matrix based on economic, social and environmental considerations (art. 1).

The Brazilian Renewable Energy Incentive Programme (Proinfa) within the Ministry of Mines and Energy, also established the inclusion of 3 300 MW of energy from wind sources, biomass and small hydroelectric centrals, in equal amounts, into the national energy grid, with a long-term objective of obtaining 10 percent of electricity from these sources (Law No. 10.438 of 2002, as amended).

Specific laws and regulations addressing the production and commercialization of bioethanol and biodiesel, establishing blending requirements, providing incentives and creating sectoral institutions, will be discussed in turn, in sections 2.4 and 2.5 below.

2.3 Institutional framework for bioenergy

The National Energy Policy Law No. 9.478 created the National Petroleum Agency, renamed National Agency of Petroleum, Natural Gas and Biofuels in 2005 (*Agência Nacional do Petróleo, Gás Natural e Biocombustíveis - ANP*), under the Ministry of Mines and Energy (*Ministério de Minas e Energia* – hereinafter Ministry of Energy). The ANP is tasked with guaranteeing the supply of petroleum products and biofuels to the entire nation and serves as the institutional framework through which oil, natural gas and biofuels are regulated. It is responsible in particular for overseeing and authorizing activities related to production, quality control, import, export, storage, distribution, retail, marketing, and environmental conservation - essentially carrying out national biofuels (and petroleum) policy. For example, it organizes biodiesel auctions to ensure compliance with the compulsory blending requirement. It is also in charge of enforcement of the law and is empowered to impose sanctions.

The National Energy Policy Law also established a National Council for Energy Policy (*Conselho Nacional de Política Energética*) within the Ministry of

Energy. The Ministry of Energy is broadly tasked with advising and recommending policy to the President on energy security as a whole, and provide guidelines for the development of the biofuels programme (art. 2). The Council, on the other hand, is tasked with suggesting policy measures to ensure the supply of raw energy to remote or inaccessible areas, establishing guidelines for specific use and trade of (both renewable and non-renewable) energy, and planning for anticipated future energy needs. The Council was established as an interagency body, the secretariat of which is made up of, among others, the ministers of: mines and energy (who serves as the president of the Council); science and technology; planning, budget and management; finance; environment; development, industry and foreign trade; national integration; and agriculture. Interagency coordination thus takes place within this forum. Energy experts from civil society and academia chosen by the President of Brazil, as well as the minister of the Civil House of the Presidency of the Republic (position akin to a chief of cabinet), a representative of the states and the federal district, and the government's Energy Research Corporation (*Empresa de Pesquisa Energética*) also participate in the Council's meetings (Decree No. 3.520 of 2000, as amended).

Other institutions currently dealing with bioenergy include Embrapa (*Empresa Brasileira de Pesquisas Agropecuárias*), the government's agricultural research entity under the aegis of the Ministry of Agriculture, Livestock and Supply (*Ministério da Agricultura, Pecuária e Abastecimento* hereinafter referred to as Ministry of Agriculture). The latter has a decentralized agroenergy unit focused on bringing to fruition the government's new aim of using research and technology to steer the agroenergy sector towards a more environmentally friendly and economically efficient future. The Embrapa Agroenergy Unit started its work in 2007 and receives most of its funding from external sources. In the medium term, it expects to enlarge its pool of researchers (current total staff is 28 people) and to coordinate the work on bioenergy of researchers in Embrapa's 40 decentralized units. In addition, Embrapa has other research units affecting the bioenergy sector, namely Environmental Research, and Satellite Monitoring and Agricultural Technological Information. It also promotes integrated farming system technologies which are currently deployed for the recovery of degraded lands, both integrating agriculture-livestock, and agriculture-livestock-forestry activities in the states of São Paulo, Mato Grosso, Paraná and Goiás.

The Ministry of Environment (*Ministério do Meio Ambiente*) has an Energy and Environment Coordination Unit and is also working on the design of ecological-economic zoning regulations for bioenergy crops (*zoneamento ecologico economico - ZEE*). ZEEs are promoted by the Ministry of Environment, and implemented by a Coordinator Commission on ZEE and a Permanent Working Group for the Implementation of ZEE (Supreme Decree s.n. 28 December 2001, as amended).

Also, the Ministry of Foreign Relations is collaborating together with the ministries of energy, agriculture, science and technology, and of development, industry and commerce to realize the goal stated in the Brazilian Agroenergy Plan 2006–2011 of becoming a global leader in the bioenergy sector through, for example, the bilateral agreements mentioned in section 1 above.

Finally, the Ministry of Agriculture works actively with the Ministry of Agrarian Development (*Ministério do Desenvolvimento Agrário*) in developing programmes and techniques for energy generation in remote areas, and in the promotion of small-scale agriculture for biodiesel production through the Social Fuel Seal.

Regarding funding for scientific research on biofuels, Law No. 9.478 on National Energy Policy, as amended by Law 11.921 in 2009, states that 25 percent of ANP concession royalties are to be used to support scientific research and the development of applied technologies to prevent and compensate environmental damage caused by the oil, natural gas and biofuels industries, as well as first and second generation petrochemical industry (art. 49).

2.4 Bioethanol legislation in Brazil

Despite the liberalization of prices in the bioenergy sector in Brazil during the 1990s and early 2000s, there is still a significant government presence in bioenergy aimed at guiding and assuring the continued existence of the bioethanol and biodiesel industries. In the Brazilian Agroenergy Plan 2006-2011 the government gives four reasons justifying its continuing intervention.

- The seasonal nature of sugarcane production coupled with year-long demand for bioenergy requires the organization and maintenance of

stocks to stabilize prices over the year and to avoid scarcity between harvests, which requires significant planning and oversight at national level.

- As bioenergy is a strategic energy product, price fluctuations caused by scarcity or gluts in the market could potentially lead to energy crises which in turn can compromise consumer trust in the product as happened in the late 1980s.
- Despite the growing popularity of biofuels and their potential international trade significance (especially in the case of the European Union as a future mass importer), to date an international market is still more or less in its infancy, with most global production being used domestically. This means that, in times of domestic scarcity, there would be little recourse for a nation dependant on biofuels to acquire them from abroad, thus broad strategic management must take place at national level.
- The sector is characterized by highly concentrated land ownership, which for social and environmental reasons necessitates state intervention.

2.4.1 Bioethanol institutional framework

The institutional history of bioethanol is complex. Often it was (and sometimes still is) the case that there were partially overlapping, unclear allocations of responsibility which largely stem from the multi-sectoral nature of bioenergy, i.e. its agricultural, environmental, energy, and social components. Today however, things have become much more clear-cut as Brazil prepares itself for a leadership position in a global biofuels marketplace. There are currently two major players in the Brazilian sugarcane ethanol sector, the Ministry of Agriculture and the Ministry Energy. The Ministry of Environment also plays an important controlling role but is not as active as the other two ministries. Within the ministries of agriculture and energy, similar actors form the institutional core of Brazilian bioenergy, with one in each ministry acting as a steering committee to guide policy development and another to carry out that policy.

Other than the institutional bodies dealing with bioenergy in general, as was mentioned in the previous section, there are a number of important entities specific to the Brazilian bioethanol industry. First, there is the

Inter-ministerial Sugar and Alcohol Council (*Conselho Interministerial do Açúcar e do Álcool*), which acts as an inter-ministerial steering committee for the sector, tasked with assessing the appropriate involvement of sugarcane ethanol in the national energy mix, the economic mechanisms required to enhance the self-sufficiency of the this sector, and scientific and technological development of the sugarcane ethanol sector (Decree No. 3.546, 2000). The Interministerial Sugar and Alcohol Council can be thought of as an arm of the National Council for Energy Policy within the Ministry of Agriculture. The Minister of Agriculture, who presides over meetings, is joined by the ministers of finance, development, industry and foreign trade, and energy. This interagency board coordinates and reflects upon current policy, devises new policy, and must approve new mandatory blending ratios prior to their approval by the Executive (Decree No. 3.966, 2001, see next section).

Additionally, within the Ministry of Agriculture, the Secretariat of Agroenergy Production (*Secretaria de Produção e Agroenergia*) assists the Interministerial Sugar and Alcohol Council in bioethanol policy formation, while the Department of Sugar and Agroenergy (*Departamento do Açúcar e da Agroenergia*) coordinates, monitors and evaluates the execution of government policies relating to sugarcane and sugarcane ethanol.

The Agroenergy Plan 2006–2011 announced the creation of a consortium to guide research and development that has not yet been established. The reasons cited for this delay relate to the peculiarity of Brazilian law related to public-private-partnerships. Specifically, this consortium was to take part in the establishment of a national fund, amalgamating private and public resources, to carry out the goals of the National Agroenergy Plan. However, there is a requirement under law whereby government investment of public funds must remain entirely under governmental control. This has led to attempts by Embrapa to form a purpose-specific company that would conform to Brazilian public-private-partnerships law from which this fund could be set up.

2.4.2 Bioethanol blending requirements

Blending requirements for bioethanol were first set in 1931 with Decree No. 19.717 requiring a mix of 5 percent on imported gasoline, which was later transferred over to all gasoline. Since then, bioethanol blending requirements have been standard in Brazil, although the amount mandated has varied considerably over time. The most recent phase of mandated

blending has its roots in Law No. 8.723 (1993) on vehicle emission pollutants, which requires that all gasoline sold in Brazil be blended initially with 22 percent bioethanol (*álcool etílico anidro combustível*), and empowering the Executive to raise this percentage between 20 and 25 percent. Through Decree No. 3.966 of 2001 the President delegated this task to the Ministry of Agriculture, requiring prior approval of new percentages by the Interministerial Sugar and Alcohol Council. Currently, the blending requirement for bioethanol in gasoline is at 25 percent (Ministry of Agriculture *Portaria* No. 143 of 2007). There has not been much discussion about the possibility of increasing this rate further. Since almost all new automobiles being sold in Brazil are flex-fuel and ethanol prices are extremely competitive with gasoline, sugar mills are not dependant on raising the blending ratio with gasoline. Interestingly, there have been even been suggestions to abolish hydrous ethanol production (sold as a separate fuel) to be replaced by the production of anhydrous ethanol (which is then blended into gasoline).

2.4.3 Bioethanol incentive structure

Pró-Alcool originally established a number of direct incentives for the bioethanol industry. Today, however, only the tax differentials on fuels, sales tax differentials on automobiles running on bioethanol (flex fuel vehicles), and mandatory blending of bioethanol into gasoline remain.

The 33rd amendment to the Brazilian Constitution, passed in 2001, enabled the Federal Government to establish a specific tax on fuels (arts. 149 and 177). As a consequence, Law No. 10.336 of 2001 created an excise tax on the import and sale of petroleum and its derivatives, gas and its derivatives and fuel ethanol, which at present heavily favours bioethanol. This is the primary mechanism for the promotion of bioethanol in Brazil. The so-called CIDE excise tax (*Contribuição de Intervenção do Domínio Econômico*) was established to finance: subsidies for the price or transport of bioethanol, natural gas and its derivatives and petroleum derivatives; environmental projects related to the gas and petroleum industries, and transport infrastructure programmes (Law No. 10.336, 2001 as amended, art. 1). Furthermore, Law No. 10.453 (2002) stipulates that a percentage of the proceeds from this tax will be applied, *inter alia*, to equalize production costs of raw materials, purchase and sell bioethanol, and finance bioethanol storage in the form of reserves.

The CIDE tax raises billions of Brazilian reals per year, and is heavily biased in favour of the import and commercialization of bioethanol as opposed to petroleum products. Law No. 10.336 of 2001 has had successive amendments, the latest of which being Decree No. 6.875 of June 2009 establishing a tax for gasoline of the equivalent of US\$ 122 per m³ and lowering to zero the tax for bioethanol. Biodiesel is not subject to this tax.

Flex-fuel vehicles receive a sales tax differential, reduced in 2009 on account of the international economic crisis and currently being incrementally returned to its previous level. Currently, the differential gives buyers of flex fuel vehicles a tax reduction of up to 7 percent for vehicles over 2000cc; and 1 percent for those between 1000–2000cc (Decree No. 6.890 of 2009).

Other incentives exist in the form of research and development promotion by the government. Despite the agricultural research initiatives of Embrapa at federal level, most research activity in the bioenergy sector to date has taken place with state-level funding, particularly in São Paulo where 70 percent of sugarcane bioethanol production occurs.

2.5 Biodiesel legislation

It has been widely recognized that the economic and energy security successes of Brazil's sugarcane ethanol production have come at high social and environmental costs. The Brazilian Government's own Agroenergy Plan indeed states that many trends within the sugarcane production chain have encouraged "increased concentration of land ownership and the prevalence of monocultures, which have ruinous socio-economic and environmental effects." With these effects in mind, when planning the government-led push for the creation of a substantial biodiesel market in Brazil, policy makers explicitly aimed to avoid a repetition of the social problems encountered with bioethanol. As a result, the Programme for the Production and Use of Biodiesel (PNPB) came to life in 2005 with the dual goals of increasing domestic production and consumption of biodiesel while, simultaneously decreasing socio-economic inequality within and between regions.

The national Programme for the Production and Use of Biodiesel created by Law No. 11.097 (2005) promotes the introduction of biofuels in the Brazilian energy matrix, establishes a minimum blending requirement and reduces taxes on biodiesel production.

Biodiesel in Brazil is mainly produced from soybeans, which accounted for 81 percent of all Brazilian vegetable oil in June of 2009, farmed traditionally in the south and centre-west regions of Brazil. Although soy is on the lower end of the scale as regards yield potential for oil producing crops in Brazil (the most efficient is the African Palm or coconut), owing to the massive pre-existing soy capacity in Brazil it remains the primary feedstock for biodiesel. Palm, by far the most efficient option available, is expected to overtake soy in the future once new plantations have grown to maturity. When this happens, it will also potentially alter the feedstock distribution in Brazil; palm does not flourish everywhere and is grown best in the tropical North, while soy grows best in the Central West and South regions. This is one of the reasons why PNPB was designed with a strong regional component, aiming at creating a multi-feedstock biodiesel supply that utilizes a decentralized production network – in contrast to the bioethanol market, where nearly all sugarcane is first brought to São Paulo for processing before it is redistributed across the nation as ethanol. To date however, this diversification has yet to truly take off, with other types of crops providing only 3 percent of the national biodiesel feedstock, while animal residues provide the remaining 16 percent in June of 2009 (ANP 2009b). It is expected that the development of alternative crops like jatropha and palm will take around 6–7 years to reach the commercialization stage.

2.5.1 Creating a new market for biodiesel

After *Pró-Álcool* was well underway in the early 1980s, the Brazilian government initiated two short-lived programmes supporting biodiesel, the National Programme for the Production of Vegetable Oils for Energy Purposes (*Plano de Produção de Óleos Vegetais para Fins Energéticos – Pro-Óleo*) in 1980 and the National Programme for Alternative Renewable Energy of Vegetable Origin (*Programma Nacional de Óleos Vegetais*) in 1983. By 1986, however, primarily due to falling oil prices coupled with increasing vegetable oil prices, both plans were abandoned.

It was only again near the turn of the century that discussion of a biodiesel programme began once again, and in 2002 the Ministry of Science and Technology (*Ministério da Ciência e Tecnologia*) created the Pro-Biodiesel Research Network to begin assessing the technical, socio-economic and environmental feasibility of increased biodiesel use in Brazil (MCT *Portaria* No. 702, 2002). The PNPB was then launched in 2005.

2.5.2 Institutional framework for biodiesel

Prior to the creation of the Programme for the Production and Use of Biodiesel, a presidential decree created two instrumental institutional organs, playing similar roles to the policy development and implementation bodies seen in Brazil's bioethanol programme: the Executive Interministerial Commission on Biodiesel (*Comissão Executiva Interministerial de Biodiesel*) and the Managerial Biodiesel Group (*Grupo Gestor de Biodiesel*) (Supreme Decree s.n., 23 December 2003).

The Commission is responsible for policy development. It is placed within the Civil House of the Presidency of the Republic and is made up of representatives from 13 other ministries who participate in making proposals for bioenergy policy and legislation. The Managerial Biodiesel Group also comprises representatives from 13 ministries but in this case is administered by the Ministry of Energy, and functions as the implementation arm of Brazilian biodiesel policy. Both institutions are considered to be effective in allowing a wide range of views to be heard prior to decision-making, and facilitate implementation of activities with a relatively low level of conflict.

In spite of the well-functioning institutional set up that enables coordinated policy-making, many environmental groups and trade unions heavily criticize the form and content of bioenergy programmes in the country.

2.5.3 Blending requirements for biodiesel

Law No. 11.097 of 2005 introduced a mandatory blend of 5 percent biodiesel into the domestic diesel fuel supply market to commence in 2013 and called for a 2 percent blend by 2008 as an interim measure (art. 2). The law allows the National Council for Energy Policy to amend the mandatory percentage over time. As was noted in section 1 above, Brazil's National Climate Change Plan of 2008 moved the deadline for biodiesel blended at 5 percent (B5) to January 2010 following the availability of sufficient installed capacity to supply the domestic market. The likelihood of achieving this target is considered to be quite high, with interim blending as of July 2009 already at 4 percent (CNPE Resolution No. 2, 27 April 2009).

2.5.4 Biodiesel incentive structure

The incentive structure for biodiesel is based on a reduction of sales and social security tax rates (PIS/PASEP and COFINS), their exclusion from the CIDE excise tax, together with a series of specific benefits for purchasing biodiesel feedstock from family and small-scale agricultural producers, through the Social Fuel Seal scheme (further elaborated in the next section).

Law No. 11.116 (2005) reduced tax percentages for biodiesel import and production and delegated power to the Executive to further alter the sales and social security tax rates. The law provides a quite complex system whereby biodiesel producers may choose between a percentage of sales tax rate or a fixed tax amount per cubic metre. In addition, the law enables the government to reduce the fixed amount per cubic metre for biodiesel production derived from supplies by family agriculture producers or rural communities, as identified by the National Programme for the Strengthening of Family Agriculture (Pronaf). The law further establishes that criteria for the government to establish tax reductions could be based on: raw materials used in production, the status of the producer or seller and the regional origin of raw materials (art. 5). Decree No. 5.297 (2004) and its subsequent amendments (the latest in Decree No. 6.606, 2008) set out to put these proposals in operation by establishing the rates for biodiesel produced with input from family farmers. Federal taxes are reduced to zero for biodiesel produced from family farmers in the North, Northeast and semi-arid areas. Additionally, it is clear that diversification of the biodiesel inputs is another of the government objectives, with expectations for castor bean or palm to increase have an increased share of the biodiesel supply matrix.

2.5.5 Promotion of small-scale agriculture for biodiesel: the Social Fuel Seal (*Selo Combustível Social*)

Small-scale agriculture is promoted through the tax benefits (outlined in the foregoing section) awarded to biodiesel producers purchasing raw materials from family farmers and consolidated by the Social Fuel Seal scheme created by Decree No. 5.297 of 2004. This seal is unique in the world and serves as the only fully functioning certification system for biofuels at the time of writing. It is managed by, and run through, the Ministry of Agrarian Development and ties tax incentives, federal credit and government-led procurement of biodiesel to the satisfaction of requirements that promote

regional socio-economic development by requiring the integration of smallholders into the biodiesel production chain.

The Social Fuel Seal allows biodiesel producers who source a percentage of their input from feedstock produced by smallholders to receive certain fiscal incentives and to sell their biodiesel in national auctions to satisfy the regulatory blending requirement (CNPE Resolution No. 3, 2005).

Requirements to obtain the Social Fuel Seal

In order to acquire the Social Fuel Seal, producers are required to fulfil three primary obligations which shall be further discussed below. These requirements are to: (i) source a portion of their overall feedstock from smallholders, with the exact percentage required dependant upon the producer's regional location; (ii) negotiate and sign contracts with the family farmers providing their feedstock or an organization representing them; and (iii) include in the contracts the price and provision of technical assistance to the families.

The proportion of feedstock that must be sourced from smallholders varies depending on the location of production, with higher proportions being required in more socio-economically disadvantaged regions. Until February 2009, biodiesel producers in the Northeast and semi-arid areas had to source a minimum of 50 percent of their feedstock from smallholders, those in the Southeast and South regions 30 percent minimum and those from the North and Central West regions requiring only 10 percent to get the Seal (Ministry of Agrarian Development Normative Instructions No's. 1 and 2, 2005).

As of 25 March 2009, however, percentages for north-eastern producers were lowered from 50 to 30 percent causing concerns that the social benefits from the seal may become diluted and generating criticism over the concentration of 80 percent of the region's biodiesel production in a single company. In contrast, beginning in the growing season of 2010–2011, the required percentage in the North and Center-West will be increased from 10 to 15 percent as a result of Ministry of Agrarian Development Normative Instruction No. 1, 2009. Changes in percentages result from a regular review of the programme by the Executive Interministerial Commission on Biodiesel and the Managerial Biodiesel Group, which in turn consults and get feedback from stakeholders. For example, industry, unions and farmers

groups were all presented with draft proposals of both the normative instructions for comment and discussion, which led to revisions that were incorporated into the final documents.

The changes in percentages have raised questions as to the motivation behind such changes and the impact on the social objectives of the Seal. The reduction in family farming percentages allocated to the Northeast was justified on the basis of the inability of small-holder farmers to keep pace with the rapidly growing production capacity in that region that was a result of the attractive tax benefits coupled with the requirements of higher mandatory blends. The reduction enacted in 2009 to family sourcing in the Northeast is thus said to have been necessary to allow processing plants to continue legal operation.

Other explanations were that the change was to remedy an over-emphasis on family-based agriculture in the Northeast in the original plan and an under-emphasis on family-based agriculture in the Central West (where 45 percent of soybean comes from). This would make way for a move towards a homogeneous 30 percent requirement across all regions which would ultimately create more opportunities for family agricultural producers in the Central West areas where most of the soybean is cultivated. According to the ANP's website in July 2009, of the 65 biodiesel processing plants in Brazil, 7 are located in the Northeast region, 23 in the Southeast and South, and the other 35 in the Central West region. Concerns remain however, that this shift may run counter to the original 'social' intent of the seal, which was precisely to promote family agriculture in the poorest and most disadvantaged regions, not those with the highest rates of production.

The second requirement for receipt of the Seal is aimed at formalizing the relationship between family agricultural producers and biodiesel companies, and enables greater monitoring of compliance with the Social Fuel Seal scheme. It thus requires that producers negotiate and sign contracts with the family farmers who, importantly, are required to be represented and assisted by one of three currently accredited rural workers trade unions (Ministry of Agrarian Development Normative Instruction 1, art. 7 2009). Since it would not be feasible to bring corporations in direct contact with smallholders on an individual basis (as there are over 4.2 million family farms in Brazil), normally it is the case that large-scale fuel processing corporations and rural workers' trade unions draw up contracts to be then distributed to and signed by families. This requirement seeks to create cooperation that

would not likely have been possible without government intervention, and use government incentives to bring traditionally competing interests together for the benefit of both large producers and small, family farmers.

The third, associated requirement is that these contracts must include: conditions and the deadline for feedstock delivery, the price to be paid to the smallholder, and significantly an agreement to provide technical assistance to the farmers. In order to comply with the latter requirement, biodiesel producers are allowed to discount the price of such assistance from the amounts subject to federal taxation. Normative Instruction 1 of 2009 recommends four guiding principles for the focus of this assistance, namely: food security and sovereignty, sustainable production systems, generation of income, and reducing rural poverty. The Normative Instruction goes on to further describe criteria and procedures to maintain the Seal. There are some concerns, however, that as contracts are not made publicly available, that families may not profit as much as they could be from the programme. In particular, when cooperatives or unions are non-existent in the producing area or are unavailable to assist in the contract formation, the intermediaries used in their stead have often been contested for being unrelated to the workers' movement or unqualified to assist in such matters.

Overall, under the Social Fuel Seal scheme, the number of beneficiaries among family farmers is reported to range between 75 000 to 90 000 families in 2008, and is expected to reach 110 000 in 2009.

It should be finally noted that the requirements of the Social Fuel Seal scheme do not evaluate compliance with labour laws or with environmental regulations. Its impact in promoting sustainability could thus be enhanced by incorporating additional social and environmental requirements therein.

Government-led procurement of biodiesel from Social Fuel Seal producers

Biodiesel auctions are organized by the government to ensure compliance with the regulatory percentage of biodiesel blends. Biodiesel producers present tenders with several offers and those at best prices are purchased by private companies according to their market share. Petrobras, the state oil company, is responsible for 93.33 percent of the market.

Requirements for each biodiesel auction are set out in each call for auction and are based on Law 11.116 (2005). Biodiesel producers are required to

comply with biodiesel quality regulations and must be authorized to sell by the ANP. The ANP authorization for biodiesel plants is based upon rules stipulated by the Ministry of Finance (*Secretaria de Receita Federal*), which among other things requires a minimum amount of capital of 500 000 Brazilian reals (approximately US\$ 272 000; *Secretaria de Receita Federal* Normative Instruction No. 516 of 2005). As noted by Garcez *et. al.* (2009), such requirements prevent the participation of smaller firms in the market, limiting their role to that of farming only.

The current 65 authorized producers supply the domestic market through public auctions that take place every trimester and are administered by the ANP. Of these 65 ANP-certified plants: 31 were listed by the Ministry of Agrarian Development as holders of the Social Fuel Seal in April 2009, with the other 34 apparently having fulfilled the requirements of the Ministry of Agrarian Development but which have not yet received the Seal. The auctions not only set the price for biodiesel and ensure the supply of biodiesel necessary to meet the regulatory requirements, but seek to promote social goals, by reserving a large percentage of the biodiesel market to those firms counting with the Social Fuel Seal. At the 14th auction that took place on 29 May 2009, 80 percent of the market was reserved to producers with the Social Fuel Seal with 91 percent of total production capacity belonging to distilleries that are in possession of the Social Fuel Seal. Currently, with the 4 percent blending requirement, domestic consumption is at about 1.8 billion litres per year. From the 460 million litres purchased in the 14th auction (before the 4 percent requirement came into effect in July 2009), 368 million litres were purchased from firms with the Social Fuel Seal.

2.6 Environmental and agricultural legislation with impact on biofuels

The legal framework for bioenergy is influenced by laws dealing with the environment, labour, land planning and food security. Although for present purposes a complete review of these is beyond the scope of this study, some of the most relevant policies and laws with the potential to affect the biofuels industry will be identified in this section, including: the National Climate Change Plan and the national framework regarding the presentation of projects to the UNFCCC Clean Development Mechanism; agricultural and ecological zoning laws determining or limiting land uses; and the Forestry Code. A brief overview of a current debate in Brazil over the formal legal recognition of customary and other types of land rights in the Amazon, and

examples of voluntary agreements to promote the social and environmental sustainability of biofuels are also presented.

2.6.1 National Climate Change Plan

Brazil designed its National Climate Change Plan, which contains several targets related to bioenergy, in 2008. In particular, in line with its Agroenergy Plan 2006–2011, the third objective of the climate change strategy is to "encourage the sustainable increase of the share of biofuels in the national transport matrix and also to work towards the structuring of an international market for sustainable biofuels." To this end the Plan proposes, *inter alia*, to encourage industry to achieve an average annual increase in the consumption of bioethanol in the Brazilian transport sector of 11 percent. Additionally, the 5 percent blending requirement for biodiesel is expected to result in an increase of consumption levels of more than 60 percent of biodiesel's current share of the Brazilian overall transport fuel matrix.

Regarding the sustainability of sugarcane production, bioethanol from crops raised in areas identified as appropriate for sugarcane cultivation according to ecological-economic zoning regulations (see section 2.6.4 below), is expected to avoid the emission of 508 million tonnes of carbon dioxide during the decade 2008–2017, which would otherwise be released if fossil fuels were burned instead of sugarcane ethanol. The Plan also proposes the gradual elimination of burning to clear sugarcane fields in areas where harvesting mechanization can take place. In this regard, prior legislation already required that areas larger than 150 hectares that can be mechanized (on land with an incline of less than 12 percent), should use harvesting mechanization, increasing in increments of 25 percent of each agro-industrial unit every five years (which means that at least 50 percent of all these units should be mechanized at the time of writing according to Decree No. 2.661, 1998, art. 16). The Plan notes the need to conclude agreements with the productive sector, cooperate with states where sugarcane field burning still occurs as well as the implement a monitoring system. Importantly, São Paulo state, where the vast majority of Brazil's sugarcane is grown, has partnered with the National Sugarcane Industry Union (UNICA) to end the practice of sugarcane field burning by 2014 in most areas where mechanization may take place. This state has passed a law to completely eliminate this practice by 2021. Additionally, in order to counteract the jobs which will be lost through the increasing mechanization of this sector, the agreement with the

sugarcane industry includes a commitment by the private sector to re-train 7 000 cane field workers per year.

Objective 5, to "eliminate the net loss of forest coverage in Brazil by 2015" is also relevant for the sustainability of biofuel production. The Plan sets out a series of limitations on deforestation and aims to reduce illegal deforestation rates in Brazil, explicitly noting that the development of planted forests for the production of fuel may reduce pressures on native forests. Specifically, the Plan states that promoting forest plantations with the objective of producing sustainable charcoal will reduce pressures on native forests from which a substantive percentage of charcoal is still supplied for the iron and steel industries. The Plan also sets out an Energy Forests Programme, coordinated by the forests unit of Embrapa, which among other issues will consider the production and use of sustainable charcoal to replace coal in iron and steel production facilities, mainly through the promotion of forestry in degraded areas. EMBRAPA's agroenergy unit is also planning work on evaluating the life-cycle energy balances and greenhouse gas balances of agroenergy crops, although research has not yet begun on these matters.

Brazil's National Climate Change Plan was originally mandated by Presidential Decree No. 3.515 (2000). An Inter-ministerial Committee on Climate Change was created by Decree No. 6.263 (2007) and tasked with the design of a national policy on climate change and a national climate change plan. This Committee is coordinated by the Civil House of the Presidency of the Republic, and consists of seventeen federal bodies. Besides ministerial representatives, the Brazilian Forum on Climate Change (*Fórum Brasileiro de Mudanças Climáticas* - FBMC) is also allowed to participate in meetings of the Interministerial Committee. The FBMC is a multi-stakeholder advisory forum chaired by the President of Brazil that includes 12 ministers, the director of the National Water Agency (*Agência Nacional de Águas*) and civil society representatives or individuals with recognized expertise in this field designated by the President of Brazil (Decree of 28 August 2000). The FBMC website includes as participants in the Forum: 6 representatives of state-owned companies, 22 representatives of research institutions, 7 private sector representatives, 12 NGO representatives and 2 journalists.

Responsibility for the implementation, monitoring and evaluation of the National Plan on Climate Change is assigned to the Executive Group on Climate Change (*Grupo Executivo sobre Mudança do Clima*) that is coordinated

by the Ministry of the Environment. The National Climate Change Plan, aside from being adopted within multi-stakeholder fora, was also subject to public consultations as required by Decree No. 6.263/2007. These featured presentations, for example, at the 3rd National Conference on the Environment and meetings of the Brazilian Climate Change Forum.

2.6.2 National framework for the Clean Development Mechanism

The implementation of the Kyoto Protocol's Clean Development Mechanism (CDM) is relevant for the future development of bioenergy projects in Brazil. Even though at present, the failure to adopt methodologies on biofuels within the international climate change regime has meant that biodiesel and bioethanol production projects are not yet recognized within this mechanism, several other bioenergy-based projects have been presented and are already earning certified emission reduction credits.

In fact, Brazil is the third largest contributor to emission reduction credits within the CDM at 6.71 percent, following China (58.81 percent) and India (11.63 percent). There are 160 CDM projects registered in Brazil, with average annual reductions amounting to 20.7 million tonnes of carbon-dioxide equivalent. It is worth noting that unlike classic CDM projects where a foreign partner invests in new technologies in exchange for the emission reduction credits generated by the project, 65 percent of Brazilian CDM projects are unilateral, which means that projects are financed domestically and do not have a foreign partner to which credits would accrue. They thus allow Brazilian firms to sell their carbon credits at their highest value – when emission reductions are already certified.

The CDM in Brazil is managed by the Inter-ministerial Commission on Global Climate Change (*Comissão Interministerial de Mudança Global do Clima*), which acts as Brazil's Designated National Authority in charge of approving CDM projects and confirming that they indeed contribute to sustainable development. The Commission is chaired by the Ministry of Science and Technology and is comprised by representatives of the ministries of: energy; transport; development, industry and international trade; planning, budget and management; agriculture; external relations; cities; treasury; environment (holding the vice-presidency of the Commission), as well as a representative of the Civil House of the Presidency of the Republic. The Interministerial Commission issues regulations defining the requirements for presentation of

CDM projects and guidelines for the presentation of projects, including requirements for the consultation of stakeholders, which are all available online.

A look at Brazil's CDM database of approved projects provides an overview of the type of bioenergy projects in Brazil. Of a total of 211 projects it shows 44 projects which substitute fossil fuels with biomass for the generation of energy (most using sugarcane bagasse, several using residues from agriculture and forestry, and one using animal tallow). Methane capture in swine farms is present in 38 projects and biogas generation from methane in landfills in 27. Methane capture projects, however, are in most cases not yet generating electricity.

2.6.3 Forest Code

The Forest Code (*Código Florestal*) is relevant to the development of bioenergy-related activities because it is this law which determines the percentage of forest areas that may be used for productive activities and sets out limitations on deforestation for agricultural and charcoal production (Law No. 4.771, 1965 last revised in 2006). It is thus a key determinant of the sustainability of biofuel production.

For example, the Forest Code establishes Permanent Preservation Areas to protect riparian vegetation (art. 2), requiring vegetation to remain untouched when it is found on: riversides from 30 to 500 metres depending on the size of the river; water sources for at least 50 metres; on slopes steeper than 45 degrees; and hilltops over the height of 1800 metres. Any deforestation in these areas requires federal authorization following requirements set out in article 4 of the Code, including for example, a positive assessment by the state environmental agency. In addition, authorities may determine other permanent preservation areas, for example to prevent erosion (art. 3).

The Forest Code allows the extraction of wood in planted forests for fuel or for the production of charcoal, except in permanent preservation areas (art. 12). It also determines that, in the absence of other specific regulations, forests may be cut with the caveat that a percentage must be left standing as a "legal reserve", i.e. an area where only sustainable activities may be performed. The percentage of forests that must be maintained as legal reserves is: 80 percent in rural forest properties within the Amazon states; 35 percent on rural savannah (*cerrado*) properties within the Amazon states;

20 percent on rural forest, native vegetation properties in other regions; and 20 percent in rural properties on general farming areas in any region of the country (art. 16). These percentages, however, may be altered with the adoption of ecological-economic zoning legislation at the state or federal level as, for example, when legal reserves were reduced from 80 to 50 percent in the states of Rondonia and Acre in 2008 based on a recommendation by the National Commission on Environment (Decrees No. 5.875 of 2006 and No. 6.469 of 2008).

The Brazilian National Congress is presently evaluating a draft law on payments for ecosystem services (project 5487/2009), which would provide monetary benefits to those farmers who comply with laws protecting legal reserves and permanent preservation areas. Congress held public consultations on this law in 2009.

2.6.4 Ecological and agricultural zoning strategies

A key set of regulations influencing the production of biofuels in Brazil are ecological-economic zoning regulations (*Zoneamento Ecológico-Econômico - ZEE*). Criteria for the establishment of these are set out by Decree No. 4.297 (2002, as amended) to Brazil's Environmental Policy Law No. 6.938 (1981). This territorial planning instrument is portrayed as one of the primary tools for ensuring the sustainability of biofuel production in Brazil. ZEEs are promoted by the Ministry of Environment's Secretary of Sustainable Rural Development and implemented by the Coordinator Commission on ZEE and the Permanent Working Group for the Implementation of ZEE (Supreme Decree of 28 December 2001, as amended).

The main mechanism for the implementation of these zoning strategies is the tying of governmental agricultural subsidies and credits to ZEEs (Programme ZEE Brazil 2 009). Prior examples of tying insurance and credit schemes to climatic risk zoning by Embrapa have reportedly been successful in saving millions of dollars in avoided losses that would have resulted from growing crops in areas subject to negative climatic or hydrological conditions. In the case of ecological-economic zoning for bioenergy crops, it has yet to be defined how the ZEE will be linked with other existing agricultural zoning strategies (like those based on climatic and hydrological conditions), as well as strategic environmental assessments and environmental licenses.

Pending the adoption of wider-ranging ZEEs, zoning is a legal tool that is already used for the cultivation of sugarcane in Brazil. For example, in 2009 the Ministry of Agriculture adopted Ministerial Resolution (*Portaria*) 54 establishing agricultural zoning for sugar cane in the State of Rio Grande do Sul for the period 2008–2009. The Resolution uses a map of climate risks, considering: quality of soil, hydrological traits, productivity, and technology as the criteria to establish which municipalities are suitable for the cultivation of sugarcane. Furthermore, the Resolution specifies that, notwithstanding the general capacity for cultivation of this crop, those areas that conflict with the production of grain are left out, thus incorporating a food security criterion as one of the limiting factors in the production of bioethanol. This strategy enables producers within permitted areas to access federal credit and insurance, and is expected to be expanded and implemented nationally.

In fact, national ZEE planning for sugarcane is expected to identify some 25 million hectares suitable for this crop, leaving out sensitive areas such as the Amazon rainforest and Pantanal. Concerns over the sustainability of dedicating such a large area to one crop (considering that sugarcane currently occupies approximately 8.9 million hectares) are assuaged by experts who do not actually expect an area of that size to be actually planted with sugarcane. Rather, setting aside this area is considered to prevent the expansion of the agricultural frontier into sensitive areas while the industry develops towards second generation biofuels with improved yields and towards the use of bagasse and straw for liquid biofuels production. It is thus clear that ZEE, along with mechanization requirements, is considered one of the strongest instruments available for the government to promote the sustainability of sugarcane. The zoning criteria reportedly will incorporate the general criteria applicable to agricultural zoning along with cropland limitations based upon political aims to preserve: primary vegetation, sensitive ecosystems (mainly the Amazon rainforest and Pantanal), Indian Reserves, conservation areas (national and state parks) and areas considered strategic for food security (mainly soybean, corn, cotton, bean and rice).

Some criticism is, however, starting to emerge in relation to the delay in adopting the sugarcane ZEE, partly as a result of protracted debates over areas that would be left out of the zoning (namely Cerrado, Pantanal and Amazon) and perhaps also as a result of pressure exerted to change the zoning away from that originally envisaged. Thus, the effectiveness of the instrument will eventually hinge upon which areas are left out and the

compliance or monitoring mechanisms included in the law as well as the degree of political consensus with those states left out of the zoning.

2.6.5 Environmental impact assessment legislation

Regarding environmental impact assessments, Brazil follows criteria set out in Resolution No. 1 (1986) as amended of the National Commission on Environment (CONAMA), which defines activities that require environmental impact assessment. Among activities relevant to the bioenergy industry are: power plants over 10 MW regardless of their source of fuel; agro-industrial complexes and units, including alcohol distilleries; any activity using charcoal or similar products in quantities exceeding 10 tonnes per day; and agricultural projects exceeding 1 000 hectares (art. 2).

More specifically, environmental impact assessments must respect state or municipal regulations as appropriate, and must include at least: an environmental diagnosis of the area affected by the project; an analysis of impacts of the project and its alternatives; identification of mitigation actions; and a monitoring programme of positive and negative impacts (art. 6).

A summary of the impact assessment is also required together with alternative options for the justification of the project's compatibility with sectoral and governmental programmes (art. 9). All summaries of impact assessments are to be made available to the public, and entities with jurisdiction over the studies (Ministry of Environment and state or municipal agencies, where appropriate) have the option to call for public audiences to receive comments thereon (art. 11).

2.6.6 Amazon tenure legislation

A heated debate has taken place regarding the formal recognition of tenure rights in the Amazon. The law under scrutiny is Law No. 11.952 (2009), based on provisional measure 458, which grants tenure rights to individuals occupying land in the Amazon states. This law was intended as a remedial measure for the land disputes that followed the government incentives (introduced as far back as the 1970s) for the occupation of public land. Conflicts arose where some settlers occupied land traditionally belonging to local and indigenous groups. The 2009 law thus restricts this process to Brazilian citizens who are not owners of another rural estate in the country

and who effectively possessed the area prior to 1 December 2004 (art. 5). In rural areas, the occupants are also required to be engaged in agriculture. It explicitly excludes from this procedure, referred to as "regularization", *inter alia*, lands that have been traditionally occupied by indigenous peoples or that are nature reserves. The law leaves communal lands to be dealt with in accordance with specialised legislation.

It should be noted that the President vetoed the proposed article 7, which would have allowed the regularization of land occupied by legal entities or by individuals through third parties. However, questions remain on the possibility for individuals to obtain tenure rights based on their self-declaration, rather than pursuant to an inspection by authorities. In addition, it is unclear why the law discriminates against smallholders, who must hold on to the land for at least 10 years whereas larger estate owners who are allowed to sell these properties after 3 years (art. 15).

Criticisms of this law are summarized in a motion filed by the Attorney General to the Supreme Court requesting the declaration of Law 11.952 as unconstitutional. The motion notes that the law departs from its objectives to: promote social inclusion and agrarian justice; protect good-faith land tenants that derive their livelihoods from the lands they inhabit; and to improve controls and monitoring of deforestation in the Amazon. The motion goes further to state that Law 11.952 grants unjustified privileges to land grabbers (*grileiros*) who have illegally appropriated vast areas of public lands. In addition, the law's allowance of an exception to the required visit by authorities to lands claimed by tenants (art. 13) may allow land claims to be filed by fake tenants with the risk that such claims may refer to lands traditionally occupied by indigenous or local communities. Lastly, the motion indicates that the law allows land regularization by those who illegally deforested Amazon lands, without imposing as a condition the rehabilitation of degraded lands, thus illustrating another failure of the law to conform to environmental principles reflected in the Constitution (*Procuraduria Geral da Republica* 2009).

2.6.7 Voluntary instruments promoting social and environmental guidelines for biofuels production

Voluntary agreements are highlighted here as instruments that have been useful to promote social rights and environmental standards in the biofuels production chain. Especially in areas where consensus among states is

elusive, voluntary agreements among industry, government entities and stakeholders pave the way for a higher degree of compliance with environmental and social criteria in the bioenergy sector. The agreements highlighted as most relevant in this field include: the Agreement for the Eradication of Slave Labour, the Soybean Moratorium in the Amazon, and the Agreement between the Amazon and São Paulo States on soybean.

Agreement for the eradication of slave labour

The National Pact for the Eradication of Slave Labour (*Pacto Nacional Pela Erradicação do Trabalho Escravo*) is an initiative coordinated by the International Labour Organization (ILO) and two leading Brazilian NGOs focused on corporate social responsibility and combating slave labour. The Pact's signatories agree not to source inputs from firms included in an online list published by the Ministry of Labour and Employment (*Ministério do Trabalho e Emprego*) that identifies firms sanctioned for imposing working conditions analogous to slavery (Ministry of Labour, *Portaria* No. 540, 15 October 2004). Since its adoption in May 2005, the Pact has garnered the signatures of more than 160 firms and associations, and is considered a successful initiative, supporting government efforts to eradicate slave labour conditions that still exist in some rural areas. Of particular interest to the bioenergy sector is the inclusion of several firms in the list that are part of the bioenergy production chain. At the time of writing, the *Lista Suja* contained eight sugarcane producers, affecting 2 294 workers and 31 charcoal producers involving 436 workers.

The crucial work carried out by the Ministry of Labour, through the mobile monitoring group (*Grupo Especial de Fiscalização Móvel*) in combating slave labour has been highlighted by interviewed government and industry sources, even though some considered it necessary to provide more resources to establish wider-reaching enforcement.

Corporate social responsibility in the Amazon

On 24 July 2006, the industry associations of the soybean exporters and processors and some of their members, civil society organizations and the Ministry of Environment came together in a Soybean Working Group and established a Moratorium on the Purchase of Soybeans from the Amazon biome. The latest agreement extended the moratorium to July 2010 (art. 1).

The moratorium is a voluntary commitment by the private sector not to engage in the commercialization of soy originating from deforested areas of the Amazon Biome after 24 July 2006. The agreement also includes a private sector commitment to support the government in:

- monitoring soybean plantations in the Amazon biome;
- raising awareness of producers of the need to comply with the Forest Code, and the registration and environmental licensing of rural properties; and
- collaborating on the definition and application of, and compliance with, public policy including ZEE of the Amazon (art. 1).

Civil society organizations also agree to provide technical support to the initiative and to promote the creation of payments for ecosystem services and the preservation of forests (art. 2).

Initially a private sector and civil society partnership, the moratorium earned the support of the government through its Environment Minister, who signed the initiative in 2008. In the 2009 Agreement, the Ministry of Environment agreed to: promote the registration and environmental licensing of rural properties, with priority given to soybean municipalities in the Amazon biome; promote ZEE in the Amazon States (Amazonia Legal); ensure that the map of the Amazon biome is defined at a scale adequate to allow for the monitoring of rural properties; and cooperate in the development of incentives for sustainable production including the payment for ecosystem services (art. 3).

The Soybean Working Group believes the moratorium has been instrumental in the reduction of the annual deforestation rate in the Amazon. Since its inception, progress has been made, for example, through the creation of a combined satellite monitoring system, as well as on-site confirmation with visits and flyovers that allow the identification of firms not respecting the moratorium, which are subsequently eliminated from the list of suppliers of soybean exporter and processing firms.

In 2009, for example, the monitoring of 630 polygons reportedly established a compliance rate of 97 percent (Ministry of Environment 2009). In fact, the information generated by National Institute of Spatial Research (*Instituto Nacional de Pesquisas Espaciais*) on loss of forest cover in the Amazon in 2008 indicated a freezing of deforestation in areas monitored by the Soybean

Working Group and an increase in the deforestation of areas smaller than 100 hectares (which are not yet monitored). Further efforts in monitoring smaller properties and additional government efforts to implement land-registration and environmental licensing for rural properties are expected to contribute to this common effort.

Another initiative is the "Corporate social responsibility for soybean production and trade between the Amazon and São Paulo City Pact" signed in 2008 by 14 institutions including several NGOs, the International Finance Corporation, the ILO and two supermarket chains. The initiative is undertaken through the purchase and financing of soybeans and derivatives from sources that do not employ slave labour and conform to requirements by the Ministry of Environment and the Soybean Moratorium. In particular, the Amazon-São Paulo City Pact does not allow for the purchase of soybean inputs from:

- firms listed in the Ministry of Labour's *Lista Suja* of firms found to employ work analogous to slavery;
- rural properties included in the Soybean Moratorium areas; or
- areas cleared for soybean production under the Soybean Moratorium but identified by IBAMA as being in non-compliance with registration requirements (*areas embargadas*).

3. CONCLUSIONS

With more than three decades of experience in promoting the biofuels sector through government regulations and market-based instruments, Brazil currently runs one of the largest and most successful bioenergy programmes in the world. Although concerns were voiced from early on in Brazil's biofuel history, more recent questions over the environmental and social sustainability of this sector have garnered significant political attention as biofuels have ceased to be thought of simply as sources of energy security and economic growth, but have taken on a decidedly green role in light of potential environmental benefits which they may offer. Amid expectations that international demand for biofuels will grow significantly in the near future, and spurred by policies to both enhance energy security and reduce greenhouse gas emissions primarily in industrialized nations, Brazil's *Pró-Álcool* and Biodiesel programmes have shifted focus to concurrently

improving the environmental and social aspects of bioenergy production and consumption.

Since *Pró-Álcool's* inception, it has focused on diversifying the country's energy matrix and providing tools to increase the competitiveness of the sector, but initially lacked a particular focus on environmental or social criteria. Over the years however, it became more apparent that despite its economic and productive success, Brazil's bioethanol programme had had serious social and environmental consequences, with the government's own Brazilian Agroenergy Plan 2006–2011 acknowledging that sugarcane production had encouraged detrimental effects on land ownership distribution and socio-economic and environmental considerations.

Thus the government has been making strides in addressing these issues and with change visible in recent years. For example, sugarcane producers are working together with state governments to introduce mechanical crop harvesting, reducing both environmental and social negative impacts in the long term. Economic-ecological zoning (EEZ) of sugarcane is underway to aid in better decision-making in sugarcane production and expansion. Additionally, with the inception of the Brazilian government's biodiesel programme in 2005, development objectives such as the promotion of family-based agriculture and provision of technical assistance to small-hold farmers have become a primary focus of the industry.

The following represents a re-cap of elements of the Brazil's biofuels programme which point towards legal and other options for economic, environmental and social sustainability in biofuels development.

3.1 General agroenergy policy framework

Although national policy and legislation are primarily concentrated on bioethanol and biodiesel production, the Brazilian Agroenergy Plan 2006-2011 addresses four main products: bioethanol, biodiesel, planted energy forests (for charcoal) and residues from agriculture and forestry (including sugarcane bagasse). It explicitly sets out social, environmental and economic goals that can potentially benefit a wide range of stakeholders. The goals of the Plan are to:

- establish a framework and provide orientation for public and private actions aiming at the generation of knowledge and technologies that

contribute to the sustainable production of energy through agriculture and to the rational use of this renewable energy; and

- ensure the competitiveness of Brazilian agribusiness and support specific public policies, such as social inclusion, regional development and environmental sustainability.

3.2 Market mechanisms

3.2.1 Creation of a market

Creating a domestic bioenergy market is a complex endeavour, with one of the most challenging aspects being to create demand even in cases where bioenergy production costs often initially outweigh those of alternative (often fossil) sources of energy. In the Brazilian context, the primary regulatory instruments used to meet this challenge are mandates requiring that all gasoline sold in Brazil contain 25 percent bioethanol and all diesel contain 4 percent biodiesel. Drastic production increases since the national biodiesel plan's inception has seen the programme running ahead of schedule to such an extent that in Brazil's National Climate Change Plan of 2008, the original 5 percent blend mandated by 2013 was moved up to 2010. The success of the bioethanol programme on the other hand has both contributed to, and has been boosted by, the introduction of a growing fleet of flex-fuel automobiles that can run on pure gasoline, pure bioethanol or any combination of the two. Sales of these flex-fuel vehicles constitutes over 80 percent of vehicles sold in Brazil, aided by favourable taxation and high oil prices. The creation of this technology for the Brazilian context is illustrative of the spillover effects bioenergy can have in other areas. However, blending requirements should be progressive and flexible, and in conformity with installed production capacity to prevent bottlenecks in the supply. To ensure this flexibility, Brazil has set up a blending range for ethanol, managed by the multi-sectoral Interministerial Sugar and Alcohol Council (*Conselho Interministerial do Açúcar e do Álcool*). The Council may establish blending requirements within the 20–25 percent range adjusting requirements in light of changes in government policy goals, commodity prices and installed capacities. Similarly, in the biodiesel case the inter-ministerial National Council for Energy Policy (*Conselho Nacional de Política Energética*) is also entitled to decide on blending requirements.

3.2.2 Fiscal mechanisms

Historically, six instruments were utilized for the promotion of bioethanol production in Brazil, of which only tax deductions and the blending mandate remain at present. The instruments employed to aid in the formation and success of the Brazilian bioethanol industry initially focused on both ensuring security of supply and assurance demand for bioethanol, and included: (i) price controls: the requirement that bioethanol be priced lower than gasoline at the pump; and a guaranteed even price across the nation for all bioethanol producers; (ii) tax incentives for automobiles running on bioethanol; (iii) loans to bioethanol producers for expanding capacity; (iv) the obligation for gas stations to sell bioethanol; (v) the creation and maintenance of strategic bioethanol reserves; (vi) and guaranteed government purchases.

This significant government intervention was, from the very beginning, designed to be temporary, with the industry becoming highly competitive and self-sufficient only after release from governmental price controls. At present, the government still plays a leading role in promoting bioethanol through: regulatory blending requirements, tax deductions to both bioethanol producers and sales of flex-fuel vehicles, and the provision of federal credit to biofuel producers.

3.3 Institutional framework for bioenergy

Over the decades Brazil's institutional structure for bioenergy has gone through a dramatic evolutionary process, with the structure of today's system looking very different from that which existed at the outset. For both bioethanol and biodiesel, the institutional set up is complex and multi-sectoral given the agricultural, environmental and energy components of bioenergy. Nonetheless, for bioethanol key entities are found primarily under the Ministry of Agriculture and the Ministry of Energy (under both of which exist a steering committee to develop policy and another body to implement that policy). The Ministry of Environment has a comparatively minor role.

In the case of biodiesel, the explicit social concerns of the programme necessitate a broader range of institutional actors. Playing similar roles to the policy formulation and implementation bodies seen in Brazil's bioethanol programme, the Executive Interministerial Commission on Biodiesel and the Managerial Biodiesel Group (within the Ministry of Energy), are both

inter-ministerial groups, functioning respectively as the policy development and implementation arms of Brazilian biodiesel sector. Both institutions are considered to be effective in allowing a wide range of views to be heard prior to decision-making, and have been relatively successful in consensus building. Concerning the Social Seal, the Ministry of Agrarian Development is responsible for adjusting required smallholder participation and other aspects of qualification for receiving the Social Seal, as well as for approving use of the Seal. Despite the socially inclusive requirements of this programme, the policy-making process remains relatively top-down in nature, with a good level of interagency coordination but without much space for public participation. Also, enhanced transparency in key decision-making processes would lend greater legitimacy to procedures.

3.4 Social aspects of the biofuels framework

3.4.1 The biodiesel programme

The National Programme for the Production and Use of Biodiesel and its related Social Fuel Seal scheme provide incentives for large biodiesel producers who supply the domestic market, to source from, and improve the livelihoods of, smallholders in economically sensitive regions. Aside from the regulatory blending requirement, the main legal instruments used to promote biodiesel production include tax exemptions for biodiesel producers that incorporate a percentage of input from specific crops (grown in poorer regions) or buy from family-based farming.

In particular, the regionally differentiated incentives have significantly motivated producers to source large portions of their feedstocks from family farmers, to the extent that, in the Northeast, additional production capacity was built up to take advantage of the highly lucrative tax incentives offered. The result was that smallholders were unable to meet the production demanded by processing plants and the required percentage to be sourced from family farms was then lowered in 2009 so that the production plants remained in compliance with the law. In addition, regarding the favourable contractual arrangements, tying economic incentives for producers to interact with rural trade unions has proven to be a conducive mechanism to meet divergent interests in the bioenergy sector. Finally, biodiesel producers are required to provide technical assistance for family farmers in line with government guidelines related to food security and sovereignty, sustainable production systems, generation of income and reducing rural poverty.

Producers are rewarded in this respect, as costs related to such technical assistance are deductible from taxes. This scheme therefore seeks to increase the potential to improve not only the economic performance of farmers in terms of biodiesel production but also their long-term livelihoods as well.

To date, although required by law to be assisted by a union or other cooperative organization, the conclusion of contracts between producers and family farmers in many cases is still rather opaque. Especially when dealing with sensitive social issues such as development options for the rural poor, changes such as the 2009 adjustment in the required amount of smallholder participation discussed in section 2.5.5, should be undertaken in a more transparent manner in the framework of consultations of all concerned stakeholders.

While economically the programme has seen enormous success, the impact of social criteria – and their readjustment – should be closely monitored to ensure a large number of family-based farmers are actually benefiting from the system. In addition, the Social Fuel Seal scheme should be further developed to address also environmental sustainability concerns. The following are options to enhance the overall sustainability performance of the Social Fuel Seal programme, including the inclusion of environment protection criteria:

- It may be useful to incorporate requirements into the Seal that promote the respect of ZEEs for soybean when these are developed, ensuring that soybean plantations do not result in deforestation or the destruction of vulnerable ecosystems.
- It would also be helpful to continuously monitor and evaluate the percentages of raw materials that must be sourced from family farmers and cooperatives, and the promotion of technical assistance to farmers. Independent verification of the impacts of the Social Fuel Seal on poor farmers, especially in the most disadvantaged areas, will be key to ensuring that the objective of the seal is achieved on the ground. Monitoring the programme's effects on family farmers could be based on indicators showing: numbers of farmers that benefit from the system; areas where these farmers come from; and benefits received compared to alternative land uses in those areas. The total area of soybean production and its growth into marginal or vulnerable ecosystems should also be closely monitored, and feed into ZEE strategies.

- The Social Fuel Seal scheme should contain an explicit stipulation that certified bioenergy production conforms to all environmental requirements included in other sectoral legislation, including, for example, environmental impact assessment regulations and the procurement of inputs from suppliers that comply with the registration requirements of the Brazilian Institute of Environment and Renewable Natural Resources (*Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis- IBAMA*). This would be important not only to supply the domestic market – where compliance with such requirements may be evaluated at other points – but to ensure that biodiesel exported with the Social Fuel Seal may be interpreted as being in compliance with applicable federal and state environmental and forest protection legislation as well.
- Another aspect to be considered is the granting of the Seal to small biodiesel plants, which may thus be able to enter domestic and international markets. In order to accomplish this, the capital requirement of 500 000 Brazilian reals established by the Ministry of Finance will have to be eased.

3.4.2 Social and environmental considerations of sugarcane harvesting

Manual harvest of sugarcane is usually associated with very harsh working conditions for labourers. Such conditions have to do with the climate, lack of provision of adequate food, accommodation and safety equipment, or the respect of labour laws by some sugarcane producers.

Aside from enforcing existing regulations on labour standards in Brazil, a key factor cited by interviewed persons was the reform of the labour market mechanisms. In particular, the industry's system of payment, based upon tons harvested, does not provide incentive for employers to respect labour standards and tends to shorten the working life of labourers who are pressed to perform unsustainable levels of physical exertion. Improved labour conditions could thus be provided through: a ceiling on permissible tons harvested per worker per day set out on the basis of medical standards for healthy and sustainable effort or payment per hour; maximum number of hours; medical insurance schemes or medical support options; and a minimum wage.

Besides regulation, it is worth noting other approaches adopted to improve the social aspects of the bioenergy section. Brazil has a National Plan for the Eradication of Slave Labour, and regularly updates a list, available online, which includes all firms that have been found to impose working conditions analogous to slavery (known as the *Lista Suja*). Government efforts are also supported by a voluntary agreement for the eradication of slave labour.

The promotion of mechanized harvests, coupled with restrictions on sugarcane field burning – a method usually used to 'soften' the cane prior to manual harvesting – are key to promoting improvements in the health and environmental conditions of sugarcane production. Mechanized harvesting require a maximum slope of the terrain limiting the possibilities for its use in all regions (most notably in many areas of the Northeast, where approximately 30 percent of sugarcane production still takes place). In São Paulo state, where most sugarcane is cultivated, an agreement with the national sugarcane industrial union has been adopted to end the practice of sugarcane field burning by 2014 in most areas where mechanization may take place (in addition to a São Paulo state law requiring the end of this practice completely by 2021). This policy is conducive to improving working conditions in the sugarcane sector and is coupled with agreements to train cane cutters in preparation for their re-entry into the labour market.

As a result of mechanization, not only is additional sugarcane residue available for energy and bioethanol production purposes, but avoiding burning of sugarcane fields also contributes to reducing carbon dioxide emissions and preventing pollution and its health-related problems. The trade-off for leaving the harsh labour conditions of the cane fields behind is unemployment for many seasonal workers, something which must be monitored and minimized. In this regard, government policies targeted at the areas of origin of these workers – who are generally migrant workers – combined with stricter policies requiring sugarcane producers to support government efforts in the reemployment of cane field workers should be introduced, which may be funded at least in part by the increased profits which will be enabled by mechanizing the harvesting process.

3.4.3 Voluntary agreements

Voluntary agreements between the government, industry and civil society are useful to advance and support government policy regarding the social and environmental sustainability of bioenergy crops. These agreements evidence

a proactive approach to engage industry and civil society in public policy formulation and implementation. The Soybean Moratorium Pact has allowed the biodiesel industry to join forces with governmental and non-governmental actors to ban the purchase of soybean from Amazon producers. The Pact has been reported to be successful in requiring suppliers of the vegetable oil industry to comply with land registration requirements. This also paves the way for the future adoption of a ZEE for soybean in Brazil.

The Pact for the Eradication of Slave Labour is an example of a voluntary agreement among private sector firms and associations in support of government labour policies, which commits the signatories to refrain from purchasing any input from firms listed in the *Lista Suja*. Such an agreement is useful to raise awareness of the need to eradicate illegal working conditions and to promote compliance with national regulations and labour laws.

The success of these voluntary initiatives ultimately depends on a sustained effort by the national government to continue monitoring labour and environmental conditions.

3.5 Environmental aspects of the biofuels sector

A set of regulatory mechanisms, featuring compulsory instruments and voluntary schemes, are already being tested in Brazil to promote biofuels sustainability focusing on an improved consideration of environmental criteria. Voluntary agreements and intra-market agreements, as well as international pressure and requirements for exports, have been cited as key drivers for improvements of labour conditions.

Considering Brazil's negative experience with the environmental impacts derived from the sugarcane monocultures and the significant productivity gains in the last decades, most recommendations related to sustainability of this crop point towards limiting the expansion of the agricultural frontier towards fragile or valuable ecosystems. This could be accomplished with ecological-economic zoning (ZEE) laws, which appears to be the intention of ministries and stakeholders concerned with protecting, in particular, the Amazon and Pantanal biomes. The primary method by which these zoning laws are implementation is the linking of governmental agricultural subsidies and credits to particular zones. Therefore, in addition to the technical criteria used as a basis to define land areas appropriate for sugarcane cultivation, key

components of an appropriate zoning strategy would be tying federal credit, insurance or other types of economic incentives with compliance with zoning requirements. Monitoring systems to assess compliance would also be an important constituent.

Brazil's ZEE for sugarcane, although pending final government endorsement, is a valuable example of a zoning strategy that is based on economic, social, agricultural, food security and environmental criteria. As this will be the first bioenergy crop to use the ZEE system, it will likely form the basis for other ZEEs in bioenergy crops such as soybean, and therefore the establishment of a credible, legitimate system now will be crucial in ensuring support for subsequent ZEEs.

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C. ESTONIA

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1. INTRODUCTION

The first section of this chapter describes the factual situation with regard to the production and consumption of bioenergy in Estonia, including future prospects. Thereafter, the most important international and European legal instruments that directly influence the national legal framework for bioenergy in Estonia are explored. The third section focuses on the national laws and policies applicable to the fuel and energy sector followed by an analysis of Estonia's environmental legislation. The fifth section zeroes in on legislation applicable to forestry and the cultivation of energy crops. The review concludes by singling out the main features of the legal framework for bioenergy in the country.

1.1 Bioenergy in Estonia: the current situation

Wood-based bioenergy is the most important renewable energy source in Estonia. In 2006, the share of firewood in Estonia's primary energy balance was around 15 percent while the share of hydro and wind energy was around 0.2 percent. Wood-based biomass fuel is mainly used in heat-only boiler plants, sometimes co-fired with peat. Firewood is also used domestically for heating and cooking, especially in rural areas.²⁴ Small amounts of energy are generated from dung in the form of biogas, from wastewater sludge and from municipal and industrial wastes as landfill gas.

The share of bioenergy in Estonia's electricity production remains low. In 2007, the share of renewable energy in Estonia's electricity production was around 1.1 percent and the share of peat 0.1 percent.²⁵ The share of renewable energy increased from 0.3 percent in 2004 due to the construction of several large wind farms in 2005.²⁶ Estonia's Long-Term Development Plan for the Fuel and Energy Sector 2002–2015 also aims to increase cogeneration of heat and power to 20 percent of the total electricity production by the year 2020. Some of this would be based on wood fuels, while the main contribution is expected to come from peat, which is not classified as a renewable energy source.

²⁴ The Estonian Biomass Association, information available at www.eby.ee.

²⁵ Estonian Electricity Market Inspectorate. 2007. Estonian Electricity and Gas Market 2006. Tallinn (hereafter Estonian Electricity and Gas Market 2006).

²⁶ Ministry of the Environment. National Allocation Plan of Estonia for Greenhouse Gas Emission Allowance Trading for Years 2008–2012, available at www.ec.europa.eu (hereafter: Estonia's Second National Allocation Plan under the EU ETS).

Overall, the distinctive feature of the Estonian energy sector is its heavy reliance on oil shale, which is a type of sedimentary rock that is available locally. In 2006, the contribution of oil shale in Estonia's electricity production was 97 percent.²⁷ One of the most important questions for the future of the Estonian fuel and energy sector concerns the use of oil shale. The positive aspects of using oil shale include the security of energy supply and relative independence from the world market prices.²⁸ The currently operating oil shale mines are estimated to guarantee the supply until 2025, and with new mines, the total supply of oil shale could last until 2060.²⁹ The negative aspects of oil shale include environmental damage from the mining and burning of oil shale as well as its low calorific value.³⁰ In 2016, the transition period granted to Estonia for implementation of the EC Directive 2001/80/EC on the limitation of emissions of certain pollutants into the air from large combustion plants shall expire. This means that most of the oil shale-using boilers of the Narva Power Plant – which belongs to the state-owned Eesti Energia and the most significant energy producer in Estonia – will not be able to maintain the European limits for sulphur oxide and nitrous oxides. The question of future electricity thus played a role in Estonia's parliamentary elections in 2007, with opinions ranging from the modernization of the Narva Plants to the construction of more wind farms or the construction of a nuclear power station.³¹

1.2 Future prospects

In line with the European targets on renewable energy sources, the Estonian Government had previously undertaken to increase the share of renewable energy to 5.1 percent of the total energy consumption by 2010. The new EC Directive 2009/28/EC on the promotion of the use of energy from renewable sources increases Estonia's national target to 25 percent by 2020 (see Annex I of the EC Directive). Estonia is bound by the European target to increase the share of biofuels and bioliquids in the transport sector to 5.75 percent by 2010 under EC Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport. The new EC Directive 2009/28/EC increases the proportion of biofuels to be used in the

²⁷ Estonian Electricity and Gas Market 2006, p. 13.

²⁸ Ministry of Economic Affairs and Communications. Estonia's Long-Term Development Plan for the Fuel and Energy Sector until 2015 (hereafter Estonia's Long-Term Fuel and Energy Sector Development Plan), available at www.legaltext.ee.

²⁹ Estonia's Second National Allocation Plan under the EU ETS, p. 2.

³⁰ Estonia's Long-Term Fuel and Energy Sector Development Plan, p. 3.

³¹ Estonian Electricity and Gas Market 2006, pp. 84 and 85.

transport sector to 10 percent by 2020 and introduces measures aimed at ensuring that the target is achieved in an environmentally sustainable manner.

However, some constraints have been identified to increasing the use of local bioenergy in Estonia. The Estonian Forestry Policy of 2002 attempts to balance the environmental and ecological value of forests with their ability to produce economic and social benefits, and is guided by the principles of sustainable forestry and efficiency of forest management. The maximum felling volume of around 13 million cubic metres in the Forestry Development Programme until 2015 has been characterized as relatively high but can be justified by the current prevalence of middle-aged and mature stands in private forests. After large forest areas reach maturity within the next 10–20 years, the availability of fuel wood is estimated to decrease by 2030.³² On the other hand, a large share of cut fuel wood and wood-processing waste is already being used in the energy conversion processes.³³ Logging waste could be a considerable additional source.

The Long-Term Development Plan for the Fuel and Energy Sector until 2015 estimates that planting of energy forests and energy grass plantations is not economically viable in Estonia. Feasibility studies are currently conducted on short-rotation plantations to cultivate bioenergy from fast-growing trees but their economic viability remains uncertain.³⁴ The Long-Term Fuel and Energy Sector Development Plan also mentions the possibility of using straw for energy production but highlights economic limitations due to the transport distance. According to the Plan, integrated manure handling systems for large farms to generate energy and produce fertilizers are not precluded. Given these constraints, in its second National Allocation Plan under the EU Emissions Trading Scheme for 2008–2012, the Estonian Government thus estimated that most of the new production from renewable energy sources would be based on wind power. "Only a minor increment" was foreseen from biomass in combined heat and power plants given that the most important fuel, peat, is categorized as fossil fuel."³⁵

³² Muiste, P., Roostalu, H., Padari, A., Paist, A., Kask, Y. & Orru, M. 2004.

³³ Estonia's Long-Term Development Plan for the Fuel and Energy Sector until 2015, p. 4.

³⁴ Personal communication with Katrin Heinsoo, Institute of Agricultural and Environmental Sciences, Estonian University of Life Sciences, 23 January 2008.

³⁵ Estonia's National Allocation Plan under the EU ETS, p. 32.

2. INFLUENCE OF INTERNATIONAL AND EUROPEAN LAW

International and European legal instruments have had an important influence on the development of Estonia's legal framework for bioenergy. Estonia is party to the UNFCCC (ratified on 11 May 1994), the Kyoto Protocol (ratified on 14 October 2002) and the Convention on Biological Diversity (ratified on 11 May 1994). It has been a World Trade Organization (WTO) member since 1999.

As a party to the UNFCCC and the Kyoto Protocol, Estonia is obliged to meet its 8 percent greenhouse gas emissions reduction target for the period 2008–2012. In addition, having been a member of the EU since 2004, Estonia participates in the formulation of European environmental and energy policies. It is also obliged to transpose the relevant European legislation into its national legal system. The European regulatory framework encompasses a number of recently introduced instruments that influence the legal framework for bioenergy in Estonia.

2.1 The UNFCCC and Kyoto Protocol

Unlike other countries in this study, Estonia is included in Annex I of the UNFCCC and has a quantitative emissions reduction target under the Kyoto Protocol. Accordingly, Estonia is obliged to reduce its greenhouse gas emissions by 8 percent from its 1990 levels under the Kyoto Protocol's first commitment period (2008–2012). As a new member state, Estonia is not party to the EU's internal burden-sharing agreement concluded in accordance with Article 4 of the Kyoto Protocol by the 15 states that were members of the EU when the EU ratified the Kyoto Protocol in 2002. Achieving Estonia's Kyoto target is not estimated to be problematic, as in 2004 its emissions were 49.7 percent below the 1990 levels.³⁶ This is mainly due to the reorganization and restructuring of the energy, industrial and agricultural sectors in the early 1990s.³⁷

As a country listed in Annex B to the Kyoto Protocol, it is possible for Estonia to participate in all three flexible mechanisms of the Protocol. These include the Joint Implementation (JI) and Clean Development Mechanism (CDM) which are project-based mechanisms and Emissions Trading. Of these, JI and emission trading may create incentives for increasing the use of

³⁶ UNFCCC: Report on the review of the initial report of Estonia (FCCC/IRR/EST), p. 5.

³⁷ Estonia's Second National Allocation Plan under the EU ETS, p. 9.

bioenergy in Estonia. JI is based on the idea that an Annex I country hosting a project that reduces greenhouse gas emissions or enhances their removal through sinks, can sell the remnant emissions (known as emission reduction units or ERUs) to another Annex I country. Thus, projects involving renewable energy, including bioenergy, are strong candidates for JI projects.

Given that emissions in most transition economies have declined from the 1990 levels even without conscious climate policy efforts, they are considered as potential sellers under the Kyoto Protocol's emission trading scheme. To make their 'hot air' more attractive and politically acceptable for buyers, many transition economies are planning to launch so-called Green Investment Schemes (GIS). While such schemes have no legal basis in the Kyoto Protocol, the basic idea of a GIS is that the seller country commits to investing revenues from emission trading in a way that reduces greenhouse gas emissions or leads to other environmental benefits. Depending on national preferences and conditions agreed with buyers, revenues from emission trading could also be used to promote bioenergy projects. Countries that have either already enacted legislation on Green Investment Schemes or are planning to do so include the Czech Republic, Hungary, Latvia, Belarus, Ukraine and Poland. There have also been plans to create a Green Investment Scheme in Estonia, but no legislation exists at the moment.

2.1.1 Estonia's eligibility to participate in the Joint Implementation (JI) and Emission Trading

A country's ability to take advantage of the opportunities provided by the Kyoto mechanisms depends on its fulfilment of the eligibility criteria defined in the international rules adopted under the Kyoto Protocol. The rules applicable to JI are contained in "Guidelines for the Implementation of Article 6 of the Kyoto Protocol",³⁸ while emission trading is guided by the 'Modalities, Rules and Guidelines for Emission Trading'.³⁹

According to the JI Rules, participation in JI requires that a country informs the UNFCCC Secretariat of its national focal point and its national guidelines and procedures for approving JI projects. Estonia has appointed the Ministry of the Environment as its national JI focal point and its national

³⁸ Decision 9/CMP.1 (FCCC/KP/CMP/2005/8/Add. 2, 30 March 2006).

³⁹ Decision 11/CMP.1 (FCCC/KP/CMP/2005/8/Add. 2, 30 March 2006).

JI guidelines are available on the UNFCCC Secretariat's website.⁴⁰ In addition, to be eligible for the so-called JI Track 1 procedures and emission trading, a country must fulfil the following criteria: be a party to the Kyoto Protocol; calculate its Assigned Amount (which is the amount of greenhouse gas emissions that an industrialized country is entitled to emit in accordance with its Kyoto target); have a national greenhouse gas inventory system; have a national greenhouse gas registry; submit the most recent annual greenhouse gas inventory; and submit such supplementary information on the Assigned Amount as required under the Protocol.

The eligibility to participate in the Kyoto mechanisms also involves a review by an Expert Review Team (ERT) of the initial reports of Annex I parties, as well as their subsequent annual reporting. After the expert review, eligibility to participate in the Kyoto Mechanisms is considered by the Enforcement Branch of the Compliance Committee of the Kyoto Protocol. On 15 April 2008, the Enforcement Branch found that Estonia had fulfilled all the initial requirements and was therefore eligible to participate in all three Kyoto mechanisms, including the JI Track 1.⁴¹

2.1.2 Joint Implementation (JI) in Estonia

Prior to the adoption of the Kyoto Protocol and the launch of JI, Estonia had gained some experience on the potential of climate policy instruments to promote the use of bioenergy. In the early 1990s, Estonia and Sweden implemented 21 projects in Estonia under the Activities Implemented Jointly (AIJ) pilot scheme under the UNFCCC. Most of the projects involved the rebuilding of boilers to use local wood fuels instead of imported liquid fuel.⁴² Unlike JI under the Kyoto Protocol, the AIJ scheme did not involve the transfer of carbon credits between the host and investor countries.

As JI was launched in 2000, Estonia has been a relatively active JI host country. It has signed memoranda of understanding on JI cooperation with Finland, Sweden, the Netherlands and Denmark. It is also a party to the Agreement on a Testing Ground for the Application of the Kyoto Mechanisms on Energy Projects in the Baltic Sea Region (BASREC).

⁴⁰ Estonia's Joint Implementation Guidelines (available at www.ji.unfccc.int).

⁴¹ Eligibility under Articles 6, 12 and 17, A list provided by the UNFCCC Secretariat, available at www.unfccc.int.

⁴² Estonia's Fourth National Communication under the UNFCCC, November 2005, p. 80, available at www.unfccc.int.

Of Estonia's current JI projects, four involve the use of bioenergy. Three projects implemented in the early 2000s between Estonia and Finland relate to the conversion of boilers in district heating boiler plants from oil to wood chips. These small projects in Tamsalu, Kadri and Paide are estimated to generate 178 000 tonnes of Emission Reduction Units (ERUs) by the end of 2012.⁴³ Estonia's fourth bioenergy project is the Saarenmaa Animal Waste Management Bioenergy Project between Estonia and the Baltic Sea Region Testing Ground Facility.

Estonia's largest JI projects, however, involve the construction of wind farms. Although it was the government's view that there would be more potential for bioenergy projects in Estonia, project developers (who tend to represent the private sector) have invested in wind energy.⁴⁴ Overall, Estonia's second National Allocation Plan under the EU emissions trading scheme proposed to set aside 948 531 greenhouse gas emission allowances (corresponding to 1 tonne of CO₂eq each) for existing JI projects during the Kyoto Protocol's first commitment period.⁴⁵ In addition, Estonia proposed to set aside a further 9 547 862 allowances for JI projects at various stages of development. Most of the new JI projects are expected to involve the rapidly developing wind energy sector.

2.2 Bioenergy under European Law

Estonia joined the European Union in 2004. Combating climate change ranks as a high political priority in the EU that has sought to play a leadership role in international climate change negotiations. To implement the Kyoto Protocol, the EU has adopted a number of instruments that have an important influence on the legal framework for bioenergy in Estonia. The most relevant of these are: the target to increase the share of renewable energy to 21 percent by 2010 (with individual targets for each member state); the target to increase the use of biofuels in transport to 2 percent by 2005 and to 5.75 percent by 2010; and setting a price and limitations for greenhouse gas emissions under the Emissions Trading Scheme (ETS).

EC Directive 2004/101 of 27 October 2004 made the EU emission allowance trading scheme compatible with the JI and CDM mechanisms of

⁴³ The website of the Ministry for the Environment contains a list of JI projects and the estimated emission reductions, available at www.envir.ee.

⁴⁴ Personal communication with the Estonian Ministry for the Environment, 25 January 2008.

⁴⁵ Estonia's Second National Allocation Plan under the EU ETS, pp. 7 and 8.

the Kyoto Protocol by enabling operators to use the Kyoto mechanisms in the allowance trading scheme in order to fulfil their obligations. Apart from those pertaining to land use changes and forestry activities (art. 11(3)(b)), credits from JI (emission reduction units) and CDM (certified emission reductions) are equivalent to EU emission allowances. This directive precludes the possibility of emission reduction units and certified emission reductions being counted twice where they result from activities which also lead to a reduction in, or limitation of, emissions installations covered by EC Directive 2003/87 of 13 October 2003 (see section 2.2.1 below) unless an equal number of allowances is cancelled from the registry of the member state of the certified emission reductions' (or emission reduction units') origin.

The EU has also been active in the negotiations relating to the post-2012 period after the expiry of the Kyoto Protocol's first commitment period, and it has already adopted a number of unilateral targets relevant for the post-2012 period. The guiding principle of the EU's climate policy is the "2°C target" – in other words, limiting the global average temperature increase to a maximum of 2° Celsius from pre-industrial times. In May 2007,⁴⁶ the European Council also established targets to: reduce greenhouse gas emissions unilaterally by 20 percent by 2020, or by 30 percent if other countries accept the same level of commitment in the context of global framework on climate change; increase the share of renewable energy in EU's energy consumption to 20 percent by 2020 with national targets for each member state; increase the share of biofuels in transport petrol and diesel to 10 percent in each member state by 2020; and save 20 percent of energy consumption by 2020 through improved energy efficiency.

In January 2008, the European Commission put forward a proposal for a comprehensive "Climate change and renewable energy package", which incorporates measures to fight climate change and promote renewable energy. It was adopted in December 2008 by the European Council and the European Parliament. The objective behind this package is to attain the EU's overall environmental target of a 20 percent reduction in greenhouse gases and a 20 percent share of renewable energy in the EU's total energy consumption by 2020.⁴⁷ Besides Directive 2009/28/EC on renewable energy, a key component of the legislative package is the Directive 2009/29/EC of 23 April 2009 amending Directive 2003/87/EC so as to improve and

⁴⁶ "20 20 by 2020", Europe's Climate Policy Opportunity, 2008.

⁴⁷ For more information see www.eur-lex.europa.eu.

extend the greenhouse gas emission allowance trading scheme of the Community.

The following contains a brief discussion of the key European legal instruments that influence the legal framework for bioenergy in Estonia. Since the new climate and energy legislative package was very recently enacted, it is necessary to provide an overview of the preceding EU instruments that have shaped Estonia's current legislative framework to date, as well as outline the country's commitments under the new directives which must be transposed into the Estonian legal system by 31 December 2012 for Directive 2009/29/EC and 5 December 2010 for Directive 2009/28/EC.

2.2.1 EC framework for renewable energy

Since the mid-1990s, the EU has sought to promote renewable energy. The policy is motivated, *inter alia*, by climate change mitigation objectives, the desire to enhance EU's energy security and to promote sustainable development as well as regional and rural development. The transport sector accounts for the most rapid increase in greenhouse gas emissions within the EU. In addition to the potential to reduce greenhouse gas emissions, biofuels could improve energy security by tackling oil dependence. However, they are more expensive to produce than other forms of renewable energy.

The EU renewable energy framework was underpinned primarily by two instruments, EC Directives 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market (RES-E Directive) and 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport, both of which have now been repealed by EC Directive 2009/28/EC on the promotion of the use energy from renewable sources.

EC Directive 2003/30/EC on the promotion of the use of biofuels for transport set the minimum proportion of biofuels and other renewable fuels to replace diesel and petrol at 2 percent by 2005, and 5.75 percent by 2010 (art. 3). Any measures taken to meet these targets must consider the overall climate and environmental balance of various types of biofuels (art. 3(4)). The directive also contains reporting requirements of member states to the Commission. The different types of biofuels include bioethanol, biodiesel, biogas, biomethanol, biodimethylether, bio-ETBE, bio-MTBE, synthetic hydrocarbons, biohydrogen and pure vegetable oil (art. 2). According to the

Commission, the 2 percent target for 2005 was not achieved and the estimated share of biofuels by the end of 2010 stood at 4.2 percent in 2008.⁴⁸

Biofuels were estimated to need financial support to compete with conventional fuels. The Directive 2003/96/EC restructuring the Community framework for taxation of energy products and electricity⁴⁹ lays down a legal framework for fiscal and other national measures to promote biofuels. It contains specific provisions for reducing tax rates on energy from biomass and allowing for tax differentiation as a promotional measure. Other possible measures include the promotion of biofuels in public transport and information campaigns on the benefits and availability of biofuels.⁵⁰

The RES-E Directive created a medium-term framework that was designed to increase electricity generated from renewable energy sources. It established an indicative target of 21 percent for renewable energy sources in the total energy consumption of EU members by 2010. According to the Commission's assessment in 2008, the existing policies and measures were estimated to lead to 19 percent share of renewable energy in the EU's electricity production by 2010.⁵¹ The directive also defines indicative targets for each member state; the figure for Estonia was 5.1 percent by 2010. This target is reflected in Estonia's Long-Term Development Plan for the Fuel and Energy Sector, which will be reviewed in detail below. The RES-E Directive also encourages the use of national support schemes for renewable energy. As it will also be discussed below, Estonia's Electricity Market Act contains measures to support the production of electricity from renewable energy sources. The directive indicates that member states are to fulfil their national targets (which vary greatly) through mechanisms such as support schemes. The directive also provides for a system for guaranteeing the origin of renewable energy. Grid access is another key feature of the directive whereby states are required to take the necessary measures to grant guaranteed or where appropriate, priority access.

The new Renewable Energy Directive is similar in structure and content to the two directives it replaces. Directive 2009/28/EC stipulates that the mandatory national target for the overall share of renewable energy in gross final consumption of energy in 2020 is at least its national overall target for

⁴⁸ COM(2008) 30 of 23 January 2008, available at www.ec.europa.eu.

⁴⁹ *Official Journal* L 283 of 31 October 2003.

⁵⁰ Fagernäs, L. *et al.* 2006.

⁵¹ COM(2008) 30 of 23 January 2008, p. 3, available at www.ec.europa.eu.

the share of energy from renewable sources that year (art. 3(1)). The figure is established at 25 percent for Estonia. In order to reach this target Estonia is allowed, *inter alia*, to establish support schemes or undertake cooperation schemes with other countries. The directive contains provisions on joint projects between member states and third countries.

Each member state is further required to fulfil at least 10 percent of its final consumption of energy from renewable sources in the transport sector by 2020 (art. 3(4)). National renewable energy action plans are to be adopted which set out national targets for energy from renewable sources in transport, electricity, heating and cooling in 2020 and the measures taken to achieve them (art. 4).

Article 15 of the directive refers to "guarantees of origin" for electricity, heating and cooling produced from renewable energy sources, for the purposes of proving to the final customer and to enhance transparency. A competent body shall be designated to issue guarantees of origin and maintain national registers. Under article 16, appropriate steps must be taken by member states to develop transmission and distribution infrastructure. System operators must provide for either priority access or guaranteed access to the grid, and shall make public their standard rules relating to the bearing and sharing of costs of technical adaptations. The directive also contains provisions facilitating administrative procedures and requires the latter to be clear, transparent and non-discriminatory. The use of renewable energy should be taken into account when renovating or constructing public buildings and incorporated in building regulations. It governs statistical transfers between member states, and accessing networks and information.

The sustainability criteria for biofuels and bioliquids contained in this directive have precipitated much international discussion in relation to trade concerns, particularly with developing countries. According to these criteria, the greenhouse gas emission savings from the use of biofuel and bioliquids must be at least 35 percent (the directive provides for the methods of calculating this). Biofuels must not be cultivated from areas with a high biodiversity value, or with high carbon stock (within or external to the Community). In addition, agricultural raw materials cultivated in the Community must comply with environmental requirements of Annex II to Council Regulation (EC) No. 73/2009 of 19 January 2009 establishing common rules for direct support schemes for farmers under the common agricultural policy and establishing certain support schemes for farmers. The

directive contains verification mechanisms to monitor compliance with sustainability criteria (art. 18).

Member states are required to report to the Commission on the promotion and use of energy from renewable sources by 2011 and then subsequently, biannually until December 2021, based on which the Commission will drop up a monitoring and analysis report (art. 22). One aspect of the report detail includes how support schemes consider "renewable energy applications that give additional benefits in relation to other, comparable applications, but may also have higher costs, including biofuels made from wastes, residues, non-food cellulosic material, and ligno-cellulosic material."

Specifically relating to the transport sector, the directive asserts in article 21(2):

For the purposes of demonstrating compliance with national renewable energy obligations placed on operators and the target for the use of energy from renewable sources in all forms of transport [...], the contribution made by biofuels produced from wastes, residues, non-food cellulosic material, and ligno-cellulosic material shall be considered to be twice that made by other biofuels.

2.2.2 EU Emissions Trading Scheme (EU ETS)

One of the most important elements of EU's climate policy is the emissions trading scheme, launched in 2005. The scheme is designed to help EU member states achieve their targets under the Kyoto Protocol. Through the EU ETS, some 10 000 installations have been given quantitative limits for their carbon dioxide emissions. As the first multinational emissions trading scheme in the world, the EU ETS has been a key force driving the rapidly emerging carbon markets. By setting a price for carbon dioxide emissions, the EU ETS can also be expected to create an economic incentive to increase the use of renewable energy sources, including bioenergy. "An EU strategy for biofuels", a Commission Communication dated 8 February 2006,⁵² highlighted the advantages of biofuels in terms of reduced emissions of greenhouse gases.

⁵² COM(2006) 34 final – *Official Journal* C67 of 18 March 2006.

The EU ETS was created through EC Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community. The initial phase of the EU ETS covered the period 2005–2007 and its second phase overlaps with the first commitment period under the Kyoto Protocol from 2008 to 2012. Directive 2003/87/EC mandates all installations carrying out activities in the energy sector among others, and which emit carbon dioxide to be in possession of a permit. (During the first and second phases, the coverage of the scheme is limited to carbon dioxide emissions). As noted in section 2.2 above, in 2004, the regulatory framework for the EU ETS was complemented by the Linking Directive 2004/101/EC, which made it possible for member states to allow installations to use credits from the Clean Development Mechanism and JI under the EU ETS.

To implement the first two trading periods under the EU ETS, member states were required to prepare a National Allocation Plan (NAP) for each trading period in consultation with the relevant stakeholders. The NAP determined and justified emissions allowances for each participating installation and set aside a reserve for new entrants. In formulating the NAP, member states had to take into consideration comments from the public. The European Commission reviewed and approved the NAPs. During the first phase of the ETS, the allocations in many countries proved to be close to "business-as-usual" emissions scenarios, which was reflected in the low prices of the European Emissions Allowances (EUAs) at the end of the first trading period. For the second period, the Commission took a stricter stance and requested several countries to tighten their proposed allocations. The Commission decided to cut Estonia's proposed allocation by approximately 50 percent but the Estonian Government has challenged the Commission's decision at the European Court of Justice.

As a part of the EU's comprehensive climate and renewable energy package, several important changes were introduced to the EU ETS. From 2012 onwards, the EU ETS will cover emissions from the vast majority of flights landing in and taking off from the EU, including foreign airlines.⁵³ During its third phase from 2013–2020, the EU ETS will also cover new industries and greenhouse gases, an annually declining EU-wide emissions cap will be introduced and the auctioning of allowances will be significantly increased.⁵⁴

⁵³ Directive 2008/101/EC of the European Parliament and of the Council of 19 November 2008 amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community (2008) OJ L 8/3.

⁵⁴ Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009.

In other words, the EU ETS will include carbon dioxide emissions from petrochemicals, ammonia and aluminium as well as nitrous dioxide and perfluorocarbon emissions from certain sectors from 2013 onwards (Annex I). Directive 2009/29/EC of 23 April 2009 (amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community) does not apply to installations used for research, development or testing, nor does it apply to installations *exclusively* using biomass (Annex I). All of the total quantity of allowances must be auctioned which are not allocated free of charge (art. 10). According to article 10(2), 88 percent of this total shall be distributed in shares that are identical to the share of verified emissions for 2005, or the average of the figure from the period 2005 to 2007 (whichever is higher); ten percent of the total shall be distributed amongst certain member states for the sake of solidarity and growth (Estonia is among these and benefits from an increase in percentage allowances to be auctioned of 42 percent); and the remaining 2 percent of allowances to be auctioned, are to be distributed amongst member states, the greenhouse gas emissions of which were at least 20 percent below their emissions in the base year applicable to them under the Kyoto Protocol (Annex II(b) establishes this figure as 6 percent for Estonia).

This directive replaces national allocations with an EU-wide cap, to be defined by the Commission in 2010 on the basis of allocations for the second trading period (art. 9). Importantly, the EU-wide cap will decrease in a linear manner between 2013 and 2020 (art. 9). Member states are required to ensure that operators of installations submit duly substantiated and independently verified emissions data in order for them to be taken into account for the adjustment of the Community-wide quantity of allowances (art. 9(2)). The directive also provides that at least 50 percent of the revenue from auctioning the allowances must be spent in order to, *inter alia*, reduce greenhouse gas emissions, develop renewable energies to meet the 2020 commitment of the EU or addresses social aspects in lower and middle-income households (art. 10). As the results of the post-2012 climate change negotiations under the UNFCCC are not yet known, the directive also foresees the possibility of measures to support energy intensive industries in the event of carbon leakage (art. 10(b)).

2.2.3 Combined heat and power generation

As a part of its environmental and energy policy, the EU has also adopted measures to promote combined heat and power generation. This is a process

where electricity and heat are produced simultaneously through a single process that has the effect of saving energy.⁵⁵ The EU's measures in this field are mainly based on the EC Directive 2004/8/EC on the promotion of cogeneration based on a useful heat demand in the internal energy market.

The short-term objective of the directive is to support existing combined heat and power generation (CHP) installations and create a level playing field in the market. In the long- and medium-term it also aims to ensure that high-efficiency CHP is considered when planning new capacity. Member states can also continue or create new support schemes for CHP. Given its climatic conditions, heating plays an important role in Estonia. As it will be discussed below, the Long-Term Development Plan for the Fuel and Energy Sector thus sets a target to increase cogeneration by 2020. From the beginning of 2007, Estonia's Electricity Market Act was amended so that certain cogeneration facilities can choose between a subsidy and a more favourable tariff.

2.2.4 Waste

The EU's regulatory framework contains a number of directives regulating waste, including: EC Directive 2006/12/EC on waste; Directive 1999/31/EC on the landfill of waste (known as the Landfill Directive); and Directive 2000/76/EC on incineration of waste.

One of the objectives of the Landfill Directive is to reduce methane emissions from landfills and enhance the separate collection of biodegradable waste (paras. 16 and 17 of the preamble). Therefore, the disposal of untreated biodegradable waste to landfills has to be reduced according to the timetable laid down in the directive (art. 5). This article stipulates that member states must adopt national strategies to comply with the targets contained in the directive. In addition, they will have to increase recycling, composting of biodegradable waste, production of biogas and other forms of recovery.

There are links between these directives and bioenergy use. According to the Directive 2009/28/EC landfill gas, sewage treatment plant gas and biogases are considered as renewable energy (art. 2). The primary motive for the

⁵⁵ Fagernäs, L. *et al.* 2006.

collection of landfill gas is reducing greenhouse gas emissions into the atmosphere; energy production provides an additional benefit.

3. THE NATIONAL LEGAL AND POLICY FRAMEWORK FOR BIOENERGY

3.1 Energy policy and legislation

The legal framework for the Estonian energy markets was created in 1998 through the enactment of the Energy Act. The Energy Act was subsequently replaced by four separate Acts: the Electricity Market Act (2003); the District Heating Act (2003); the Natural Gas Act (2003); and the Liquid Fuel Act (2003).

The Electricity Market Act is the most relevant for the legal framework for bioenergy, as it contains a support scheme for renewable energy and cogeneration of heat and power. The fuel and energy sector is also affected by the applicable tax laws, of which the Value Added Tax Act (subjecting all energy to 18 percent VAT rate) and the Alcohol, Tobacco and Fuel Excise Duty Act contain provisions relevant to bioenergy.

3.1.1 Electricity Market Act

The Electricity Market Act of 2003 (RT I 2003, 25, 153) regulates the generation, transmission, sale, export, import and transit of electricity, and the economic and technical management of the power system (art. 1). It defines the operating principles for the electricity market "based on the need to ensure an effective supply of electricity at reasonable prices, and meeting environmental requirements and the needs of customers, and on the balanced, environmentally clean and long-term use of energy resources" (art. 1(1)).

Between 2003 and 2007, the Electricity Market Act contained an obligation for network operators to purchase electricity produced from renewable energy sources at a more favourable tariff of 81 Estonian Crown cents per kilowatt hour.⁵⁶ However, according to the Estonian Energy Market Inspectorate, the scheme was not transparent enough as customers did not have a clear picture of how much they were paying for renewable energy. From 1 May 2007 onwards, a new support scheme has been in place for

⁵⁶ Estonian Electricity and Gas Market 2006, p. 26.

energy produced from renewable sources and for heat and power cogeneration (RT I 2007, 23, 120, adopted on 15 February 2007 and in force since 1 May 2007). Accordingly, producers have two options. They can either sell electricity at a fixed, favourable tariff, or receive a subsidy and sell electricity at market price.

Article 57(1) of the Act includes hydro, wind, solar, wave, tidal and geothermal energy sources, landfill gas, sewage treatment plant gas, biogases and biomass as renewable energy resources. Article 57(2) contains a definition of biomass as "the biodegradable fraction of products, waste and residues from agriculture (including vegetal and animal substances), forestry and related industries, as well as the biodegradable fraction of industrial and municipal waste."

The basis for the support scheme for renewable energy is contained in article 58(1), which provides that:

A producer has the right to sell electricity as fixed supply to a seller designated by the transmission network operator or to receive support from the distribution network operator for the electricity supplied and sold to the network if it is generated:

- 1) from a renewable energy source with a generating installation which has a net capacity not exceeding 100 MW;
- 2) in efficient cogeneration regime of waste within the meaning of the Waste Act, peat or oil-shale processing retort gas is used as a source of energy; and
- 3) in efficient cogeneration regime with a cogeneration installation which is established instead of a power station which supplies customers with heat and which has the electric capacity not exceeding 10 MW.

Efficient cogeneration is thus subsidized if waste, peat or retorting gas from oil shale processing is used as source of energy production, or if the combined heat and power plant replaces existing district heating supply boiler plant with the capacity not exceeding 10 megawatts. Wind energy will be subsidized until the total annual wind energy production in Estonia exceeds 400 gigawatt hours (art. 59(4)). According to article 58(4), the purchase obligation tariff for renewable energy sources is 115 Estonian crown cents per kilowatt hour and 81 Estonian crown cents per kilowatt

hour for efficient cogeneration. The subsidy for renewable energy sources is 84 Estonian crown cents per kilowatt hour and 50 Estonian crown cents per kilowatt hour for efficient cogeneration (art. 58(6)). Both the subsidy and the purchase obligation are financed through the transmission network operator. At the beginning of each year, the transmission operator estimates the necessary amount of subsidy and divides it between distribution operators proportionate to their sale volume. The distributor adds the amount in their distribution service bills. The Estonian Electricity Market Inspectorate estimates that, within the next five years, the increase in consumer prices will be around 8.9 percent.

In addition to the support scheme in the Electricity Market Act, it has been possible to enhance the economic attractiveness of renewable energy projects through the sale of carbon credits under JI and Kyoto Protocol's emissions trading scheme. Taken together, JI and the Electricity Market Act have given an important boost to the production of wind energy in Estonia. In theory, similar incentives would be available for bioenergy projects but so far, most of Estonia's new renewable electricity production has come from wind power while biomass is used mostly for heating.

3.1.2 Alcohol, Tobacco and Fuel Excise Duty Act

The Alcohol, Tobacco and Fuel Excise Duty Act of 2003 (RT I 2003, 2, 17)⁵⁷ regulates excise duties on fuels and contains provisions to promote the use of biofuels by exempting them from the fuel excise duty.

Article 1(2) of the Alcohol, Tobacco and Fuel Excise Duty Act explains the Combined Nomenclature (CN) codes that are used for classification of goods in Europe. The CN codes used in the Alcohol, Tobacco and Fuel Excise Duty Act are contained in Council Regulation 2658/87/EEC as at 31 December 1992 and the commodity codes for fuel are based on the CN as at 1 January 2002. In the Act, CN codes are used, *inter alia*, to define biofuels.

In accordance with article 19(4) of the act, biofuel means fuel:

- 1) for which the first four digits of the CN code are 1507–1518;
- 2) which is produced from biomass, including fuel for which

⁵⁷ An English translation is available at www.legaltext.ee.

the eight digits of the CN code are 3824 90 55 or 3824 90 80–3824 90 99. The biodegradable fraction of products from agriculture, including vegetal and animal substances, products, waste and residues from forestry and the biodegradable fraction of industrial and municipal waste is deemed to be biomass;

- 3) for which the eight digits of the CN code are 2207 20 00 or 2905 11 00 and which are not of synthetic origin; and
- 4) which is produced from biomass, including fuel for which the first four digits of the CN code are 4401 or 4402.

Article 27 of the Act regulates exemptions from excise duty. Biofuels are exempt from excise duties after the issuance by the European Commission of a permit for the exemption of the biofuels from excise duty until the expiry of the permit. There is a separate provision exempting biofuels derived from biomass for which the first four digits of the CN code are 4401 or 4402 (art. 19(14)(4)). Where biofuel has been added to the motor fuel before the expiry of the permit issued by the European Commission, the amount of biofuel contained in that fuel is exempt for excise duty.

Article 69 covers biofuel permits and reporting. The rights to produce biofuel that is exempted from excise duty, to import such fuel to Estonia and to release such fuel for consumption is granted by biofuel permits. These permits are issued by the Tax and Customs Board for a period of six years. The holder of a biofuel permit must report annually to the Tax and Customs Board and provide: the name, CN code and quantity of biofuel released for consumption; the value of biodiesel released for consumption and the energy value of biofuel released for consumption (art. 69(5)). Failure to submit the report may lead to the suspension of the permit. The permit will be revoked if circumstances for its suspension continue after 30 days or if the biofuel permit holder applies to cancel the permit.

3.1.3 Long-Term Development Plan for the Fuel and Energy Sector until 2015

In 2004, the government adopted the Long-Term Development Plan for the Fuel and Energy Sector until 2015. The Plan is based on the Sustainable Development Act (1995, discussed in section 3.2.1 below) and is intended to direct the development of the Estonian fuel and energy sector until 2015. It also lays down some general trends until the year 2020.

The key strategic objectives of the Plan include ensuring fuel and energy supply with the required quality and optimal prices, and stabilizing Estonia's primary energy consumption at 2003 levels until 2010. The strategic objectives relevant for bioenergy include ensuring that by 2010, renewable energy forms 5.1 percent of the gross consumption; by 2020, electricity produced in combined heat and power production stations forms 20 percent of the gross consumption; and the development of measures which enable the use of renewable liquid fuels, particularly biodiesel, in the transport sector.

This Plan envisages, *inter alia*, the following steps for the development of the Estonian fuel and energy sector:

- increasing the proportion of peat, biofuels and wind power in the primary energy balance and decreasing the consumption of oil shale;
- continuing to increase the proportion of renewable energy beyond 2015;
- preserving the existing combined heat and power generation capacity and encouraging the establishment of new capacity. By the year 2020, the proportion of electricity produced through CHP increases from 13 percent to 20 percent; and
- developing measures necessary to enable the use of renewable liquid fuels in the transport sector.

The 5.1 percent target for renewable energy by 2010 was in line with Estonia's national target under the RES-E Directive. Directive 2009/28/EC on the promotion of the use of energy from renewable sources increases Estonia's target to 25 percent of total energy consumption by 2020, thereby requiring an update of the national policy and regulatory framework.⁵⁸

On the future prospects to increase the use of bioenergy in Estonia, the Plan indicates that a large share of cut fuel wood and wood-processing waste is already being used in the energy conversion processes. While logging waste could be a considerable additional source, the Plan identifies some constraints to increasing the use of bioenergy. First, the large-scale export of biofuels has resulted in a lack of local resources. Secondly logging waste contains a small heat load. Finally, new equipment producing only heat has already been installed in areas with a favourable heat load.

⁵⁸ See www.eceuropa.eu.

The Plan estimates that the planting of energy forests and energy grass plantations is not economically viable in Estonia. It mentions the possibility of using straw for energy production, but highlights the economic limitations of this which arise due to the transport distance. It also states that after chopping, it is possible to use wetlands plants in addition to, for instance, wood chips. It also indicates that integrated handling systems for manure from large farms to generate energy and produce fertilizer should not be precluded.

The Plan highlights that damage to landscape resulting from the cultivation and production of bioenergy must be given sufficient attention, and stresses the utility of environmental impact assessments. It indicates that in order to integrate the energy sector and environmental policies, business people should be involved in the formation of ecological reserves, particularly in regions with renewable energy potential which are rich in oil shale resources.

The Plan stresses that peat is a competitive local fuel for small-scale power industries, in boiler plants and small combined heat and power production stations. Peat can also be burned with oil shale in the renovated energy blocks of the Narva Power Station. The Plan thus states that the use of peat in the Estonian power industry is slowly increasing. However, the peat supply decreases by 2.5–3 million tonnes every year through the decay process which actually increases the amount of carbon dioxide in the atmosphere. Furthermore, environmental protection objectives, including the Natura 2000, a European-wide network of protected areas which protects natural moors,⁵⁹ significantly affect the ability to use of peat. This means that only peat from drained swamp areas can be used and new areas cannot be drained until 2025.

The Plan envisages support measures to promote the use of renewable energy. Such measures include Joint Implementation under the Kyoto Protocol and the EU's structural instruments and the Cohesion Fund. Also included is the obligation in the Electricity Market Act for network operators to purchase renewable electricity at a more favourable, fixed price. It should be noted that this law came into effect in 2003 but was modified in 2007 to include the option for renewable electricity producers to choose a subsidy instead of a fixed tariff.

⁵⁹ See Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora.

When adopted in 2004, the Plan estimated that the main renewable energy sources in Estonia would be combined heat and power production based on biofuels and wind power, although small-scale hydro industries and Estonia's obligations concerning the incineration of waste based on Directive 2000/76/EC were also mentioned. In 2006, Estonia's second National Allocation Plan under the EU ETS estimated that most of the new production from renewable energy sources would be based on wind power. "Only a minor increment" was foreseen from the use of biomass in combined heat and power plants given that the most important fuel, peat, is categorized as fossil fuel.⁶⁰

The Plan indicates that the consumption of motor fuel is expected to increase by 1–3 percent annually due to the growing number of motor vehicles. Estonia has an obligation under Directive 2003/30/EC to ensure that the indicative proportion of biofuel and other renewable fuels was 2 percent of all the diesel and petrol fuels on the market for transportation purposes by 2006 and that it will be 5.75 percent by the year 2011, calculated based on the energy value of the fuels. The Long-Term Fuel and Energy Sector Development Plan thus envisages the development of measures to enable the use of renewable liquid fuels, particularly biodiesel, in the transport sector. Such measures have subsequently been adopted by exempting biofuels from the fuel excise duty.

3.1.4 Electricity Market Development Plan 2005–2015

The Estonian Electricity Market Development Plan 2005–2015, adopted in 2006 on the basis of the Electricity Market Act, complements the Long-Term Fuel and Energy Sector Development Plan. It specifies the targets for electricity production from renewable sources up to 2015 as shown in Box 1.⁶¹

⁶⁰ Estonia's second National Allocation Plan under the EU ETS, p. 32.

⁶¹ The Estonian Electricity Market Development Plan 2005–2015, p. 20, available at www.riigiteataja.ee.

Box 1: Targets for electricity production from renewable sources up to 2015

year	wind (%)	solid biofuels (%)	others (%)
2005	1.0	0.2	0.3
2010	2.2	2.5	0.4
2015	4	3	0.5

3.2 Environmental policies and legislation

Environmental law in Estonia has developed rapidly in two phases: the period following Estonia's independence in 1991 until 1996 was marked by the rapid adoption of the most urgent laws. The period from 1997 onwards has seen the transposition of European environmental regulations into the Estonian national legal system.⁶² This transposition was based on Estonia's National Programme for the Adoption of the *Acquis*.⁶³

3.2.1 General environmental laws

The basic environmental law in Estonia is the Sustainable Development Act of 1995 (RT I 1995, 31, 384), which lays down general principles of sustainable development and serves as the basis for all environment-related legislation and relevant national programmes. The principles contained in the Act are reflected in laws and regulations concerning the energy, industrial and transport sectors.⁶⁴

In addition to the Sustainable Development Act, other general environmental laws affect the overall legal framework applicable to

⁶² Veinia, H. 2007. Codifying environmental law in Estonia: reasons, objectives and choices. *Juridica VII*.

⁶³ Estonia's National Programme for the Adoption of the Acquis, available at www.dspace.utlib.ee. The Community *acquis* refers to the body of common rights and obligations, which binds all the EU member states. It comprises: the content, principles and political objectives of the Treaties; legislation adopted in the application of the Treaties; the case law of the European Court of Justice; international agreements concluded by the EC/EU; and soft law instruments adopted by EU institutions. Applicant countries to the EU have to accept the Community *acquis* as a condition to join the Union and have to implement it from the date of accession.

⁶⁴ Estonia's Fourth National Communication under the UNFCCC.

bioenergy by laying down requirements for environmental impact assessment, environmental permitting, environmental supervision, etc., that influence the utilization of Estonia's forest resources as well as waste management, animal farming and agriculture. One such law is the Environmental Monitoring Act of 1999 (RT I 1999, 10, 15)⁶⁵ that regulates environmental monitoring as well as the processing and storage of the data obtained (art. 1). The objective of environmental monitoring is to assess, *inter alia*, the state of the environment and changes, and the amount and state of renewable natural resources, as well as to obtain information on the development of programmes and development plans (art. 2).

The Environmental Impact Assessment and Environmental Management System Act of 2005 (RT I 2005, 15, 87),⁶⁶ regulates environmental impact assessment and strategic environmental impact assessment (art. 1). It also covers participation in the European Community Eco-Management and Auditing Scheme (EMAS) and the issuance of eco-labels (art. 1). Activities with significant environmental impacts that are subject to mandatory environmental impact assessment include closure of landfills of more than 1.5 hectares; construction of facilities for large-scale rearing of pigs, poultry and bovine animals; and conversion of forest lands and wetlands of more than 100 hectares (arts. 5 and 6). Decision-makers are also required to determine whether activities in fields such as agriculture, energy, food production, waste management, waste water treatment and disposal of animal waste are expected to have significant environmental impacts (art. 6). The Act lays down detailed procedures governing environmental impact assessments and strategic environmental impact assessment, including supervision by the Ministry of the Environment, experts qualified to perform assessments and their licensing, publication of programmes and reports as well as interpretation of the results (arts. 14–20). Similar detailed requirements are also included for strategic environmental impact assessment of legal acts and strategic planning documents. The Act stipulates that legal acts that regulate, *inter alia*, agriculture, forestry and energy must be subject to strategic environmental impact assessment (arts. 31–33).

The Integrated Pollution Prevention and Control Act of 2001 (RT I 2001, 85, 512)⁶⁷ defines environmentally hazardous activities and lays down principles for the integrated prevention and control of pollution from such

⁶⁵ An English translation is available at www.legaltext.ee.

⁶⁶ Ibid.

⁶⁷ An English translation is available at www.eel.nl.

activities (art. 1). It contains procedures for the issuance of integrated environmental permits (chapter 2). Activities requiring integrated environmental permits that could be relevant for the production of bioenergy include animal farming, electricity production, waste management, as well as disposal and recovery of animal waste (art. 7). Chapter 3 of the Act contains provisions on access to information on integrated environmental permits, including granting a right to the general public to make written proposals to the person responsible for issuing permits before a draft permit is sent to the applicant for opinion, and the obligation of the issuing authority to hold public sessions under certain conditions.

The Environmental Supervision Act of 2001 (RT 2001, 56, 337)⁶⁸ specifies the rights and obligations of persons and agencies that either enforce, or are subject to environmental supervision. For the purposes of the Act, environmental supervision means an inspection of the legality of activities which use natural resources or affect the status of the environment (art. 2). It also covers compliance with planning and land use requirements. The institutions responsible for environmental supervision are the Environmental Inspectorate, the Land Board and local government bodies and agencies (art. 3). Environmental protection inspectors may issue precepts to ensure the legality of environmental protection and use of natural resources (arts. 21–24). The Act provides that the Environmental Inspectorate and Land Board must analyse the effects of environmental legislation in the relevant sectors and make proposals for enhancing environmental protection (art. 8).

The Nature Conservation Act of 2004 (RT I 2004, 38, 258, 53, 373)⁶⁹ is designed to protect the natural environment by promoting biodiversity conservation by ensuring the protection of natural habitats and populations of wild flora, fauna and fungi species, and preserving natural environments of cultural or esthetical value, as well as promoting the sustainable use of natural resources (art. 1). The Act regulates protected areas and lists Estonia's natural parks and several other types of protected areas. It contains provisions on protected natural objects and identifies building exclusion zones. Chapter 8 of the Act contains detailed provisions on protected species.

The Environmental Liability Act of 2007 (RT I 2007, 62, 396) transposes Directive 2004/35/EC on environmental liability for the prevention and

⁶⁸ An English translation is available at www.legaltext.ee.

⁶⁹ An English translation is available at www.envir.ee.

remedy of environmental damage,⁷⁰ which requires those who cause significant physical damage to the environment to restore the condition of the natural setting where the damage occurred.

The Waste Act of 1998 (RT I 1998, 57, 861)⁷¹ is the primary instrument for waste management in Estonia. It seeks to prevent waste generation and its associated health and environmental hazards (art. 1). The Act also regulates waste recovery, which includes energy production. According to the Act the use of waste recovered as raw material or any other material shall be preferred to its use as a source of energy; (art. 7). To date, there is no significant energy production from waste in Estonia. For example, landfill gas that is collected from the Pääskula landfill is used to generate heat for 1 000 flats, while electricity generation commenced in 2001.⁷²

Two environmental laws contain specific provisions relevant to bioenergy – the Ambient Air Protection Act and the Environment Charges Act and will be reviewed next.

Ambient Air Protection Act

The Ambient Air Protection Act of 2004 (RT 2004, 43, 298) was enacted to harmonize Estonia's legislation with the relevant European standards. The Act regulates activities which involve the emission of pollutants into the ambient air, damage the ozone layer, and cause climate change (art. 1). The 2006 amendment of the Act concerned, *inter alia*, greenhouse gas emissions trading, greenhouse gas emissions registry and reporting, ambient air quality and requirements for ozone depleting substances.

According to article 14, ambient air quality is described by the characteristics of the composition of ambient air which are assessed based on its level of pollution. Article 15 lists the primary pollutants that must be considered in the assessment and management of ambient air quality. Chapter 1 of the Act contains detailed provisions on modelling and measuring ambient air pollution levels as well as on the obligation of authorities to publish such information.

⁷⁰ Official Journal/L 143, 30 April 2004.

⁷¹ An English translation is available at www.legaltext.ee.

⁷² Roos, I. and Soosaar, S. 2004.

The Act governs measures to reduce ambient air pollution, including environmental requirements for fuels. According to article 58, fuel means "combustible material or substance which is used in combustion plants for the purposes of obtaining energy. Unsorted waste, whether or not it contains combustible substances, is not deemed to be fuel." According to articles 58–60, the Ministry of the Environment is responsible for issuing regulations on environmental requirements for liquid fuels, as well as for monitoring the sale of liquid fuels in Estonia.

Provisions governing ambient air pollution permits and special pollution permits address the content of such permits and procedures for their issuance. Chapter 6 of the Act concerns the protection of the ozone layer, including a definition of substances that deplete the ozone layer (art. 106) and provisions on handling of such substances (art. 107). The production, use, placing on the market, import into and export from Estonia of ozone depleting substances is either restricted or prohibited under this Act (art. 109).

Greenhouse gases and climate change also therefore fall within the remit of the Act. According to article 117, the Ministry for the Environment is responsible for organizing activities relating to climate change on the basis of the UNFCCC and the Kyoto Protocol. Chapter 7 also transposes EU provisions on the ETS, national greenhouse gas registry and reporting into the Estonian national legal system. The Ministry of the Environment is in charge of issuing 'trading licences' to installations participating in the ETS (art. 120). Article 121 governs the application process and contents of the trading licences. Article 122 details the annual reporting requirements for installations covered by the ETS.

Environment Charges Act

The Environment Charges Act of 2005 (RT I 2005, 67, 512)⁷³ regulates charges for the use of natural resources, including pollution charge rates and the procedures for calculating and paying them. It also regulates the use of revenue from related payments. Significantly, article 19 exempts biomass, peat and the use of waste as an energy source from the pollution charge related to carbon dioxide emissions. Pollution charges do not apply to: biomass as defined in the Electricity Market Act (see section 3.1.1 for the

⁷³ An English translation is available at www.legaltext.ee.

Act's definition of biomass); the incineration of peat (or fuel produced from peat); and the use of waste as a source of energy.

An environmental charge has been defined under the Act as the price of the right to environmental exploitation (art. 2). The general objective of environmental charges is to prevent or reduce environmental damage. Proceeds are divided between the state budget and local budgets. Proceeds going towards the state budget must be used for "maintaining the state of the environment, restoration of natural resources and remedying environmental damage" (art. 4(3)). Proceeds from the use of renewable natural resources (fishery, forest and game) are to be "directed for the restocking and protection of such resources" (art. 4(4)).

The Act regulates charges for the emission of pollutants into the ambient air, groundwater or soil, and upon waste disposal. The charges only apply to polluting activities that require environmental permits (art. 14) issued in accordance with relevant laws. For instance, according to article 5, environmental permits include a forest notification by the forest owner concerning planned cuttings, reforestation activities and forest damages in accordance with article 14 of the Forest Act of 2006 (RT I 2006, 30, 232). Environmental permits also include integrated environmental permits issued under the Integrated Pollution Prevention and Control Act, as well as ambient air protection permits, special air pollution permits, permits for carbon dioxide emission allowance trading under the Ambient Air Protection Act, and waste permits covered by the Waste Act. Those found carrying out activities without permits will be subject to increased environmental charges (art. 5).

Article 19(3) specifies pollution charges for carbon dioxide. The pollution charge for carbon dioxide per tonne was 15.56 Estonian crowns from 1 January 2006 until 31 December 2007, and 23.5 Estonian crowns as of 1 January 2008. The charge will be 31.3 Estonian crowns as of 1 January 2009. The charge is payable "by electricity undertakings within the meaning of the Electricity Market Act and by persons or agencies engaging in heat production who use boiler equipment" (art. 19(4)).

The system will be revised starting from 1 January 2009 (art. 19(6)). From then on, all undertakings engaged in the sale of electricity must pay excise duty on electricity instead of the pollution charge for carbon dioxide in the same extent. "The excise duty on electricity shall be paid pursuant to the

procedure provided by law" (art. 19(6)). The text of article 19 also provides that the proceeds from the excise duty on electricity shall be used for environmental protection.

3.2.2 Environmental policy

One of the key instruments guiding Estonia's environmental policy is the National Environmental Strategy, adopted by its Parliament in 1997. The Strategy provides general guidelines for environmental management and protection, and establishes key tasks and objectives. Based on these, the National Environmental Action Plan is formulated in consultation with stakeholders and is subject to regular revisions. The Ministry of the Environment is in charge of implementing the action plan. In 2005 the National Strategy on Sustainable Development (Säästev Eesti 21) was also adopted which elaborates principles for Estonia's long-term sustainable development until 2030 with the objective of linking social, economic and environmental concerns and adjusting mutual interests. These general policy instruments are complemented by more specific policy documents, including the National Programme for Greenhouse Gas Emission Reductions 2003–2012 and the National Allocation Plans to implement the EU's Emissions Trading Scheme, which are examined in detail below.

*National Programme for Greenhouse Gas Emission
Reductions for 2003–2012*

The National Programme for Greenhouse Gas Emission Reductions for 2003–2012 (RT I 2004, 59, 990) was adopted in 2004. Its key objective is to ensure that Estonia complies with its commitments under the UNFCCC and the Kyoto Protocol. It contains an overview of Estonia's obligations under the Kyoto Protocol and identifies necessary action measures. It emphasizes the strategy, structure and costs of greenhouse gas emission trading and Joint Implementation.

The objective of the Programme is to reduce greenhouse gas emissions by 21 percent from 1999 levels by the year 2010. Achieving this objective involves a reduction of 20 percent in carbon dioxide emission and 28 percent reduction in methane emissions. The Programme also foresees a 9 percent increase in nitrogen dioxide emissions. In addition, the Programme addresses issues related to JI and increasing the energy efficiency of the Estonian economy.

Estonian second National Allocation Plan under the EU ETS highlights the need to update the National Programme for Greenhouse Gas Emission Reductions, as the forecasts by sectors and by activities and the long-term macroeconomic indicators are no longer valid.

*Implementation of the EU Emissions Trading Scheme
and the National Allocation Plan*

The projected impact of the EU Emissions Trading Scheme is to improve the competitiveness of biomass compared with fossil fuels. Given the price set for carbon dioxide emissions, installations have a new economic incentive to switch to bioenergy. This is particularly relevant for those Estonian installations covered by the EU ETS that already use biomass. For these installations, it has been assumed that a fuel switch to biomass will take place from coal, peat and oil shale.⁷⁴ As explained in section 2.2.2, emissions allowances are distributed to installations covered by the ETS based on the National Allocation Plan (NAP) prepared by the national government and approved by the European Commission.

As is the case with many other EU member states, Estonia's first NAP proved relatively generous and the actual emissions between 2005 and 2007 were less than the total allocation of emissions allowances. Estonia's NAP for the second phase of the EU ETS covered 50 installations and proposed to allocate an average allocation of around 24.3 million allowances. The proposed emissions during the period 2008–2012 were higher than 2005–2007. The justification was the significantly higher gross domestic product (GDP) growth rate of around 10 percent a year, while the growth rate used for the first NAP in 2004 had been 5.3–5.9 percent. The second NAP also predicted changes in the energy sector, including the large-scale export of electricity through the new sea-cable between Estonia and Finland and a planned new cable between Estonia and other Nordic countries by 2010.

In its assessment, the European Commission did not agree with Estonia's proposal, and rather reduced the allocation by nearly 50 percent.⁷⁵ According to the Commission, Estonia's emissions in sectors covered by the ETS in 2005 were 12.6 million tonnes in contrast to the proposed annual allocation of 24.3 million tonnes for 2008–2012. The Commission explained that the

⁷⁴ ET-Bioenergy, Country Report on Estonia, 12 May 2006, p. 17, available at www.eubionet.net.

⁷⁵ Decision by the European Commission of 4 May 2007.

emission figures given by Estonia for earlier years were not independently verified, and the 2005 data thus represented the most reliable basis for the allocation. Based on its recalculation using the 2005 emissions data and relative development factors of GDP and carbon intensity for the 2005–2010 period, the Commission found that Estonia's annual average excess allocation was over 11.5 million tonnes. Like several other member states, Estonia decided to challenge the Commission's decision and commenced legal proceedings at the European Court of Justice.

3.3 Forests and forest biomass resources

Given the significance of forests and forestry-related activities to the Estonian economy, an in depth look at this sector is warranted. More than half of Estonia's territory is covered with forests. The export of forest products accounted for more than 13 percent of the total exports in 2001. The forestry sector is the main source of employment in rural areas while tax revenues from forest management are an important source of income for local municipalities. Also, firewood constitutes a cheap and locally available energy source for the rural population.⁷⁶

Much of Estonia's bioenergy potential is also related to wood and wood waste.⁷⁷ In fact, most of Estonia's capacity for bioenergy production is sourced from wood-based fuels, namely firewood, wood by-products (pellets, briquettes, wood chips and granules), forest residues and waste wood. The wood processing industry is well developed and waste from wood processing can be efficiently collected even if so-called 'second generation' processing technologies are still rather expensive. In 2002, 95 percent of waste wood was used for energy production.⁷⁸ Almost all firewood, including the wood waste, briquettes and pellets, is used for heat production in boilers.⁷⁹ There are also several companies producing wood chips, briquettes and pellets.⁸⁰ Some 17 percent of the wood fuel (including briquettes and pellets) was exported in 2006.

⁷⁶ Ministry of the Environment, Estonian Forestry Development Programme until 2010, p. 7, available at www.metsad.ee (hereafter Estonian Forestry Development Programme until 2010).

⁷⁷ Muiste, P., Roostalu, H., Padari, A., *et al.* 2004.

⁷⁸ Roos, I. & Soosaar, S. 2004.

⁷⁹ Miskins, V., Slihta, G. & Rudi, Y. 2006

⁸⁰ Roos, I. & Soosaar, S. 2004, p. 7.

In addition to their economic and biomass potential, Estonian forests are rich in biodiversity. The biodiversity indicators of Estonian wooded meadows are among the highest in the world, and Estonian forests have been preserved better than in most European countries given their low-intensity management and small share of introduced tree species.⁸¹ Overall, Estonia's forest policy attempts to balance economic and environmental considerations with sustainability and efficiency. Cutting volumes are restricted, which has the effect of limiting the use of wood resources for energy production.⁸² The optimal cutting volume of around 13 million cubic meters in the Forestry Development Programme until 2010 has been characterized as relatively high, but has been set considering the high number of middle-aged and mature stands in private forests. After large forest areas have reached maturity within the next 10–20 years, it has been estimated that the available quantities of wood fuel could gradually decrease by 2030.⁸³ It has been proposed that Estonia's biomass potential could be increased through better use of forest residues, waste wood and brushwood.⁸⁴

The key instruments concerning the use of Estonia's wood resources are the Forestry Development Programme until 2010 and the Forest Act. This section reviews the key elements of these two instruments. It also contains an overview of the current regulatory framework for short-rotation plantations in Estonia.

3.3.1 Forestry Act

The basic law applicable to the forest sector in Estonia is the Forest Act, which first entered into force in 1998. In 2006, a revised version of the Act was adopted (RT I 2006, 30, 232)⁸⁵ and entered into force in the beginning of 2007. While this extensive piece of legislation does not have any explicit provisions on bioenergy, its provisions have an important impact on biomass resources derived from forests and the availability of biomass for energy production.

The Forest Act regulates forest management and forest surveys and contains provisions governing compensation for damage caused to the environment

⁸¹ Estonian Forestry Development Programme until 2010, p. 7.

⁸² Miskins *et al.* 2004, p. 3960.

⁸³ Muiste *et al.* 2004.

⁸⁴ Roos, I. & Soosaar, S. 2004, p. 8.

⁸⁵ An English translation is available at www.remk.ee.

and liability for violations of the Act (art. 1). Its objective is to ensure the protection and sustainable management of forest as an ecosystem (art. 2.1). Forest management is sustainable if it "ensures biological diversity, productivity, regeneration capacity and vitality of forests, and the possibility of multiple uses of forest in a way that satisfies ecological, economic, social and cultural needs" (art. 2.2). To ensure the environmental interests and multiple uses of forest, at least 20 percent of Estonia's mainland must be state forest (art. 5.1).

The overall supervision of the forestry sector is the responsibility of the state and a forestry development plan must be prepared by the Ministry of the Environment every ten years and submitted to the Parliament (arts. 6 and 7). The Act regulates the Centre for Forest Protection and Silviculture, a government agency responsible for forest inventory, forest management plans, reforestation and protection, and databases (art. 8). It also covers the Private Forest Centre, a state-established foundation that assists private forest owners (art. 9).

The Forest Act contains provisions on forest management planning, including forest inventory (art. 14) and forest management plans (art. 15). Under this law, forest management is defined as reforestation, tending and use of forest and forest protection (art. 16). The Act divides forests into three categories: *protected* forests, *protection* forests and *commercial* forests (art. 17), and contains detailed management guidelines for each. In protected forests, the objective of forest management is the maintenance of natural objects, while the objective in protection forests is to protect the state of the environment. Commercial forests are those designated to generate income.

Article 24 on reforestation activities stipulates, *inter alia*, that only species suitable for the forest site may be used and that these are determined by the Ministry of the Environment (who is also responsible for preparing a list of permitted alien species). Article 25 contains an obligation for reforestation in commercial and protection forests. According to article 26, a forest owner who is planning to clear-cut forest may be required to pay a deposit to ensure reforestation.

The Act also regulates the tending and cutting of forests (arts. 27 and 28). Article 28(4) contains a list of permitted cutting types that includes regeneration cutting (clear cutting and shelterwood cutting), improvement cutting, selection cutting, track cutting and deforestation. Provisions also

elaborate on each cutting type; for instance, article 29 explains what is meant by clear cutting and the conditions under which it can be carried out. The Act sets out the obligations of forest owners, for example they are obliged to submit forest notifications on planned cuttings, reforestation and forest damage (art. 41). The Forest Act also establishes the obligation to prove the legality of cutting rights and timber transport (art. 37), as well as to notify cutting rights and timber sales (art. 38). These extensive provisions have an important impact on the overall utilization of Estonia's biomass resources, thereby also affecting the conditions for obtaining fuel wood.

The Act further regulates forest protection and empowers local environmental authorities to apply penalties in cases where environmentally damaging activities are not terminated (art. 40). According to article 40(4), for instance, all cutting areas, except clear cutting areas, must be cleared of logging waste in accordance with procedures established by the Ministry of the Environment. During reforestation and cutting, the soil must not be damaged more than permitted under law (art. 40(5)). There are also detailed provisions on the management and use of state forests and the powers and functions of State Forest Management Centre (arts. 43–65). Compensation for damage to forests and liability provisions can also be found in the Act.

3.3.2 Estonian Forestry Development Programme 2002–2010

During the 1990s, the Estonian forestry sector experienced some significant changes stemming from the emergence of private forest ownership, the rapid development of the forest and wood industry, as well as the increased option for public participation in development of the forestry sector. The Estonian Forest Policy, launched in 1995 and finalized in 1997, has been characterized as one of the first broad-based participatory processes in Estonia, involving all stakeholder groups. In order to coordinate the implementation of the Forest Policy and allocate the necessary resources, the Ministry of Environment started developing Estonia's Forestry Development Programme, approved in 2002.

The Forestry Development Programme until 2010 recognizes the high environmental and ecological value of the Estonian forests and the need to protect them in accordance with international legal instruments binding on Estonia. On the other hand, the Programme also emphasizes the capacity of the Estonian forest sector to produce material and social benefits. It states that

the utilization of this capacity will be encouraged "to the extent that the other values and benefits, including environmental ones are not lost or reduced."

The Programme highlights two basic objectives for the Estonian forestry sector, namely the sustainability of forestry and efficiency of forest management. The sustainability of forestry is defined as "the management of forests in a manner, and to the extent, that maintains their biological diversity, productivity, capacity for regeneration and vitality as well as their potential to fulfil at present and in the future ecological, economic and social functions at the local, national and global level without damaging other ecosystems." The efficiency of forest management is defined as entailing "the efficient production and effective utilization of all the forest-based goods in the short and long run".

The Programme establishes the optimum cutting volume totalling 12 597 000 m³. It indicates, however, that the volume will be adjusted in parallel with the improvement of the statistical information and calculation methods. The Programme lays down measures for the period 2002–2010 aimed at the protection of ecosystems and increasing the 7.2 percent share of strictly protected forests to 10 percent in order to preserve all characteristic forest types.

The Programme explains that Estonian forest resources are mainly used in support of the wood, paper and furniture industries, which also encompass wood processing, pulp and paper, printing and publishing. These forest-related industries are important both economically and as source of employment in the region. The Programme advocates improving the international competitiveness of the Estonian forest and wood industry, and increasing the local use of its production to ensure the maximum consumption of timber production as an aspect of forest management.

The Programme also refers to the Long-Term Development Plan for the Fuel and Energy Sector and indicates that as a part of the plan, "possibilities for promoting timber as an environmentally friendly fuel will be analysed to increase its use as an energy resource." The objectives of the Forestry Development Programme are mainly implemented through the provisions of the Forest Act.

3.3.3 Laws and regulations applicable to short-rotation forestry

As discussed in the foregoing section, it has been estimated that the availability of forest biomass in Estonia could decrease by 2030. Furthermore, at the turn of the century it was estimated that some 300 000 hectares of former agricultural land had fallen out of active use and were undergoing afforestation.⁸⁶ The question has been raised whether such lands could be exploited for the cultivation of energy crops.⁸⁷

There are ongoing feasibility studies on the use of short-rotation plantations in Estonia to cultivate bioenergy from fast growing trees. Such plantations have been characterized as "highly efficient biomass production systems with additional contributions as biological filters to low-cost and environmentally safe biological wastewater and sludge treatment."⁸⁸ According to analysis carried out by researchers at the Institute of Agricultural and Environment Sciences, the Estonian University of Life Science,⁸⁹ there are a network of laws and secondary regulations applicable to short-rotation which thus warrant examination under this section. However, it should be noted that estimating the feasibility of short-rotation plantations (SRPs) in Estonia is proving difficult⁹⁰ and the Long-Term Development Plan for the Fuel and Energy Sector estimates that SRPs are not economically viable.⁹¹

Hundreds of hectares of agricultural land in Estonia are temporarily out of use and nearly half of such land is owned by the state. The Land Reform Act of 1991 (RT I 1991, 34, 426) permits agricultural producers to use such land by usufruct (art. 34). There has been some interest in using state-owned unused agricultural land for willow plantations, however the usufruct period granted under the act is up to only 10 years (art. 34). This can be contrasted with short-rotation plantation periods which can be up to 25 years. For this reason, unused agricultural lands owned by the state cannot currently be used for short-rotation forestry as its lifetime exceeds 10 years.

⁸⁶ Estonian Forestry Development Programme until 2010, p. 10.

⁸⁷ Koppel, A. and Heinsoo, K., 2005.

⁸⁸ European Biomass Industry Association, see www.eubia.org.

⁸⁹ Based on personal communication with Katrin Heinsoo on 23 January 2008. *Existing and proposed legislation related to SRP* – analysis carried out in the framework of the BIOPROS project; for more information see www.biopros.info.

⁹⁰ Personal communication with Katrin Heinsoo, 23 January 2008.

⁹¹ Estonia's Long-Term Development Plan for the Fuel and Energy Sector until 2015, p. 4.

The provisions most relevant to short-rotation forestry in the Nature Conservation Act of 2004 (RT I 2004, 38, 258, 53, 373)⁹² relate to the planting of alien species. This is because the only poplar tree species that is native to Estonia is *Populus tremula*. According to the Nature Conservation Act, the introduction of non-native species is prohibited (art. 57). The definition of non-native species is based on a list drawn by the Ministry of the Environment (art. 57). The only permitted species suitable for short-rotation plantations is hybrid aspen (*Populus tremula* × *P. tremuloides*). The Act also prohibits economic activities in nature reserves while in other types of protected areas, the applicable restrictions depend on the level of protection (Chapter 4). In most cases, the establishment of SRPs as well as the use of herbicides and biocides in protected areas would be prohibited.

Slightly over a half of the agricultural land in Estonia is under drainage systems. The roots of a willow (which is suitable for short-rotation plantations in Estonia) may cause damage to the drainage system. In cases where willows would be grown in areas with drainage systems, permission by the local land improvement bureau is necessary. Such aspects fall within the purview of the Land Improvement Act (RT I 2003). Where the drainage system relates only to the area where short-rotation forestry is planned, obtaining a permit is likely, but not for example, where the drainage system is linked to neighbouring lands and damage to the drainage system will affect the interest of the neighbouring landowners.

Concerning the use of wastewater sludge as a fertilizer for short-rotation plantations, several laws and secondary regulations are applicable. According to the Waste Act of 1998 (RT I 1998, 57, 861), sludge is not classified as waste (art. 1). Therefore, the use of wastewater as fertilizer has not been taken into account or regulated in these laws. Secondary legislation on the Requirements for Reuse of Sludge in Agriculture, Greenery and Recultivation contains some relevant provisions, including the prohibited use of untreated wastewater sludge in agriculture, although it can be used in greenery and for recultivation.

The Water Act of 1996 (RT I 1996, 40, 655)⁹³ contains, among other things, requirements for the use of fertilizers and chemicals in agriculture. Spreading wastewater and fertilizers on frozen land is prohibited, while other limitations depend on the type of fertilizer (wastewater is not classified as a

⁹² An English translation is available at www.envir.ee.

⁹³ An English translation is available at www.legaltext.ee.

fertilizer under article 26(1)), crop demands (SRP species are not included in the list) and the region (the requirements are stricter on nitrate-sensitive areas where groundwater is endangered). Using fertilizers, chemicals and sludge is forbidden in water protection areas (art. 29). In addition to the Water Act, secondary regulations laying down a Regime of Wastewater Disposal to a Natural Waterbody or Ground and Requirements for Sewerage Constructions contain provisions on the establishment and operation of wastewater treatment plans, which could be relevant for SPRs in Estonia.

Overall, the key regulatory gap concerning short-rotation plantations concerns the use of wastewater sludge as fertilizer. This together with the rapidly changing market conditions have made it difficult to estimate the economic feasibility of increasing biomass availability through the cultivation of fast-growing trees.

4. CONCLUSIONS

As this study has demonstrated, Estonia's national legal framework for bioenergy is fairly developed. This can be partly explained by Estonia's abundant forest resources and the importance of the forestry sector to Estonia's national economy. However, the European *acquis communautaire* has played an important role in defining the legal framework for bioenergy, especially concerning laws applicable to renewable energy, climate change and environmental protection. Overall, the legal framework for bioenergy in Estonia is comprehensive and seems to cover the main issues relevant to the production of bioenergy. Sustainability concerns associated with plans to increase the consumption of biofuels in the transport sector are addressed through the transposition of the EC directive on the promotion of the use of renewable energy sources.

Some feasibility studies are ongoing concerning the potential of short-rotation plantations to cultivate bioenergy from fast-growing trees such as willows. However, estimating their economic viability is characterized as difficult given rapidly changing market conditions. The main shortcomings identified in this study concern the legal framework applicable to short-rotation forestry, including the short cultivation period under certain laws which preclude the use of idle agricultural land and also the limitations concerning the use of wastewater sludge as a fertilizer for willow plantations.

Overall, the agricultural sector has only limited potential for bioenergy production in Estonia. Therefore, questions concerning the relationship between food security and the production of bioenergy are not prevalent in Estonia. Given the availability of abandoned agricultural land, the role of land use considerations is also limited.

The use of forest resources, the main source for bioenergy in Estonia, is comprehensively regulated in a way that considers the environmental, economic and social benefits associated with Estonia's forests. The main objective of the Estonian Forest Act is to ensure the protection and sustainable management of forest as an ecosystem (art. 2) and the lengthy law contains detailed provisions on forest management in different forest categories. Importantly, it restricts felling volumes which limits the availability of wood resources for energy production.⁹⁴ In contrast to some other countries, deforestation is not a serious problem in Estonia and the forested area has actually increased since Estonia's independence in 1991 partly as a result of afforestation initiatives on idle agricultural land. Also, the formulation of Estonia's forest policies in the Forestry Development Programme 2002–2010 has been described as one of the most participatory processes in the country's history and the interests of private forest owners as well as other stakeholders have been considered in defining the maximum felling volumes.

The sectors relevant for bioenergy production in Estonia, namely forestry, energy, waste and agriculture or animal farming, are governed by several general environmental laws, imposing detailed obligations on environmental impact assessment, environmental permitting, monitoring and supervision as well as liability to restore damage to the natural environment. These laws also contain numerous provisions on public participation in environmental decision-making.

Concerning the fuel and energy sector, Estonia has adopted several legislative measures to promote the use of bioenergy and other renewable energy sources. These are in line with its obligations under the Kyoto Protocol and European law to reduce greenhouse gas emissions and promote the use of renewable energy. The Estonian Long-term Development Plan for the Fuel and Energy Sector until 2015 adopts a 5.1 percent target for renewable energy sources by 2010. Thus, in line with the RES-E Directive,

⁹⁴ Miskins *et al.* 2004. p. 3960.

the Electricity Market Act has, since 2003, contained a support scheme obliging network operators to purchase electricity generated from renewable sources at a more favourable tariff. At the beginning of 2007, the scheme was amended to increase its transparency for consumers and its coverage was extended to cogeneration of heat and power. Under the current system, producers of renewable electricity may choose between a fixed and more favourable feed-in tariff or a subsidy (art. 58). Amendments to the existing legislation are necessary to transpose EC Directive 2009/28/EC on the promotion of the use of energy from renewable sources which increases Estonia's target for renewable energy to 25 percent of gross consumption by 2020. Further incentives for renewable energy might also be necessary to ensure that Estonia meets the new targets that are binding under EU law.

In line with the European regulatory framework, Estonia must also increase the use of biofuels in the transport sector. The EU's biofuels target for 2010 is 5.75 percent. In line with the Directive 2003/96/EC restructuring the Community's framework for taxation of energy products and electricity, Estonia's Alcohol, Tobacco and Fuel Excise Duty Act exempts biofuels from the fuel excise duty. Such fiscal incentives were deemed necessary to improve the competitiveness of biofuels. EC Directive 2009/28/EC on the promotion of the use of renewable energy sources has important implications on the legal framework concerning the production and consumption of biofuels in Estonia. Most notably, the Directive sets up mandatory requirements to ensure the sustainability of biofuels count towards the 10 percent target (10 percent of the total transport energy consumption by 2020 must be from renewable sources). These would include a requirement to demonstrate that greenhouse gas emissions savings from biofuels are at least 35 percent (art. 17) and that biofuels, domestically produced or imported, do not originate from lands with high biodiversity and high carbon stock (art. 15). Given the concerns over the sustainability of the EU's 10 percent target, these new measures are necessary to ensure that the production of biofuels used in Estonia's transport sector do not promote deforestation or loss of biodiversity either in Estonia or in countries where imported biofuels have been produced. The key legal uncertainty here relates to the compatibility of the proposed sustainability criteria with WTO law as discussed in Chapter 1 of this study. However, this is something that must be addressed at the European level, if necessary.

Between 2000 and 2012 it is possible to enhance the economic attractiveness of renewable energy projects through the sale of carbon credits under JI and

Kyoto Protocol's emission trading scheme. Taken together, JI and the Electricity Market Act have given an important boost to the production of wind energy in Estonia. In theory, similar incentives would be available for bioenergy projects but so far, most of Estonia's new renewable energy production has come from wind power. On the other hand, Estonia has been planning to launch a Green Investment Scheme to improve its possibilities to participate in international emission trading under article 17 of the Kyoto Protocol. Generally, the idea of such schemes is that the government invests revenues from the sale of carbon credits in a way that further reduces greenhouse gas emissions and facilitates transition towards a low-carbon economy. Bioenergy projects could be listed as one of the beneficiaries of Estonia's possible Green Investment Scheme.

The key climate policy instrument in the EU and Estonia is the Emissions Trading Scheme in which Estonia has participated since its inception in 2005. By setting a price for carbon dioxide emissions, the ETS improves the economic competitiveness of bioenergy in comparison with fossil fuels. The ETS entered the second trading period at the beginning of 2008 with tighter allocations than during the initial period 2005–2007. The stricter stance has been motivated by the limited environmental impact of the first trading period given the lenient allocations in many European countries. EC Directive 2009/29/EC on the improvement and extension of the emissions trading system starting from 2013 expands coverage to encompass additional greenhouse gases and economic sectors. This directive replaces national allocations with an EU-wide cap and introduces rules to auction 100 percent of the total allocations. As this Directive is very recent, legislative changes have yet to take place in Estonia and have an important impact on current and new installations covered by the ETS.

The development of the international regulatory framework, especially the ongoing negotiations on the post-2012 period under the UNFCCC and Kyoto Protocol, may lead to some changes relevant to the use of bioenergy in Estonia. The deadline for completing the international negotiations is the 15th Conference of the Parties to the UNFCCC to be held at the end of 2009.

Furthermore, the European Council has decided in May 2007 that the EU will unilaterally reduce its emissions by 20 percent by 2020 regardless of what other countries will do. This commitment will be implemented through the comprehensive climate and energy policy package, adopted by the Council and the European Parliament in December 2008. Decision No. 406/2009/EC

of the European Parliament and of the Council of 23 April 2009 on the effort of member states to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020 allows Estonia to increase its emissions of greenhouse gases *not covered* by the EU ETS by 11 percent during the period from 2013 to 2020.⁹⁵ Other greenhouse gas emissions between 2013 and 2020 are subject to the EU-wide emissions cap. According to EC Directive 2009/29/EC, the Commission shall publish by June 2010 (or by September 2010 for certain adjusted quantize) the absolute EU-wide quantity of allowances for 2013 based on the total quantities of allowances issued by the member states in accordance with the Commission decisions on their national allocation plans for the period from 2008 to 2012 (art. 9). In addition, the EU has accepted to reduce emissions by a further 10 percent (amounting to a total of 30 percent) if other developed countries and most advanced developing countries also take appropriate action. This means that the EU's climate and energy legislation may be reviewed and changed after the ongoing post-2012 negotiations under the UNFCCC have been completed.

It is clear, however that the climate change challenge and the need to increase the use of renewable energy, including bioenergy, will not stop at 2020. Calculations in the Fourth Assessment Report by the Intergovernmental Panel on Climate Change indicate that achieving the EU's 2°C target means that global greenhouse gas emissions must peak within the next ten to fifteen years and then be halved by 2050. Some recent scientific reports indicate that even this may not be adequate to prevent dangerous climate change. Achieving the climate policy objectives that Estonia has adopted together with the other EU member states thus means that the potential to increase the use of bioenergy, including biofuels, must be carefully assessed. This should be done by paying due attention to environmental and social considerations, including the need to ensure sustainable forest management and agricultural production.

⁹⁵ See Decision 2008/0014.

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Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport.

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D. MEXICO

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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

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.

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 Promoción y Desarrollo de los Bioenergéticos*).¹⁰⁴ The law aims at: helping Mexico's

¹⁰² Eguren, L. 2007.

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

¹⁰⁴ *Ley de Promoción y Desarrollo de los Bioenergéticos*, 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

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

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.

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.sacre-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.

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 Promoción y Desarrollo de los Bioenergéticos*; 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. 22bis). 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 bioenergy 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 20bis).

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 Desarrollo 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 (*Programma 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.

¹²³ *Estrategia Nacional de Cambio Climático*, 25 May 2007, available at www.semarnat.gob.mx.

¹²⁴ *Programma 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

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-bidding 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 "ethanoинфlation"

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 "ethanoинфlation," 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.

¹²⁸ *Nace en México la "etanoинфlation,"* *El País*, 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.

¹³⁰ Available at gaceta.diputados.gob.mx.

¹³¹ México, *listo para convertirse en importante productor de biocombustibles*, 6 December 2007, Communication n° 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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E. PHILIPPINES

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1. INTRODUCTION

Oil consumption has grown significantly over the years, from about 225 000 barrels per day in the 1980s to about 338 000 barrels per day in 2003. Imported oil comprises more than 90 percent of the national oil consumption. The transport sector is one of the major and growing consumers of imported oil in the country. In 2003, this sector alone accounted for 46.22 percent of the total oil consumption of the country.¹³² Demand pattern indicates an average annual growth rate of 4.9 percent until 2008.¹³³

At the 12th Association of South East Asian Nations (ASEAN) Summit hosted by the Philippines in January 2007, ASEAN members and their dialogue partners had adopted the Cebu Declaration on East Asian Energy Security¹³⁴ to raise consciousness and promote cooperation in ensuring a stable energy supply to power their fast-growing economies. The Cebu Declaration recognized that while fossil fuels will continue to be used for a considerable period of time, greater energy security could be attained, *inter alia*, by promoting energy efficiency, conservation and cleaner technologies, increasing capacity and reducing costs of alternative energy resources, encouraging use of biofuels, promoting free trade and harmonizing standards on biofuels. Early 2008 saw the launching of an Energy Summit in the Philippines¹³⁵ with the theme "US\$ 100 a barrel: crisis or opportunity." The main thrust of the recommendations of the Summit was cushioning the blow of high oil prices through market reforms in the energy sector, and developing alternatives to oil for the generation of electricity to fuel the transport sector.

Republic Act No. 9.367, "An act to direct the use of biofuels, establishing for this purpose the Biofuel Programme, appropriating funds therefore, and for other purposes", was approved on 12 January 2007 (hereafter referred to as the Biofuels Act). The law imposes mandatory requirements to blend biofuels with gasoline and diesel in the transport sector, thus supporting the development of alternatives to fossil fuels. The law seeks to reduce dependence by the Philippines on imported oil and improve energy efficiency, while at the same time contributing to sustainable economic

¹³² CESDR. 2005. pp. 7 and 8.

¹³³ Information provided by the Department of Energy, available at www.doe.gov.ph.

¹³⁴ The Text of the Declaration is available at www.aseansec.org.

¹³⁵ For more information, see the summit site at www.doe.gov.ph.

growth, and protecting public health and the environment. The Biofuels Act was one of the first of its kind in Southeast Asia.¹³⁶

The initial focus in the Philippines was primarily on biofuels sourced from energy crops. However, the Renewable Energy Act of 2008 (Republic Act 953) was passed with the objective of promoting the development of renewable sources of energy and creating a framework for their commercialization, thereby accelerating the use of other forms of bioenergy, such as landfill gas and energy from animal waste.

The use of biofuels is not a recent development in the energy sector of the country. In 1982, the Alcogas & Cocodiesel Programme was initiated in response to the oil crisis of the 1970s. Concerns about skyrocketing oil prices brought about by political instability and conflicts in the Middle East and increasing global demand for oil, spurred the Philippine Government to fast-track policies and laws to ensure energy security. The programme was shelved after a year however, when the government realized that there was no real savings because biofuels cost more to produce. This point was illustrated by the World Bank,¹³⁷ which elucidates that the domestic resource cost of ethanol production was 15–20 percent higher than the cost of importing oil and refining the equivalent volume of gasoline.

Using locally produced biofuels is also expected to generate savings in foreign exchange, given that they would replace imports of fossil fuels. The Department of Energy estimates that a 1 percent blend of coco methylester in diesel can result in savings of US\$ 420 000 each year just for government vehicles using biodiesel, and up to US\$ 22 million, if used nationwide. With the blending requirement of 5 percent foreseen in the Biofuels Act, the Philippines stands to save US\$ 205 million at a volume of 429.4 million litres.¹³⁸ Even more substantial savings will be achieved when the mandated use of bioethanol in gasoline is implemented. For example, a diesel displacement of 40 million litres by incorporating a 1 percent blend of coco-methyl ester (CME), otherwise known as coco-biodiesel, will enable a savings of US\$ 22 million; for a 2 percent blend replacing 111 million litres of diesel, a foreign exchange savings of US\$ 61 million is predicted.¹³⁹ For ethanol a 5 percent blend displacing 255 million litres of gasoline will account for

¹³⁶ PNOC-AFC available at www.pnoc-afc.com.ph.

¹³⁷ World Bank, 1982.

¹³⁸ See www.pnoc-afc.com.ph/faq.ph.

¹³⁹ Lotilla, R. M. 2006.

US\$ 160 million, while the use of a 10 percent blend will mean 565 million litres of gasoline are displaced and US\$ 354 million is potentially saved.

The growing demand for biofuels is expected to spur investments in their production. The state-owned Land Bank of the Philippines has signed an agreement to provide the Philippine National Oil Company-Alternative Fuels Corporation (PNOC-AFC) with five billion Philippine Pesos (PhP), equivalent to some US\$ 125 million, to finance a jatropha development programme. The PNOC Alternative Fuels Corporation (PNOC-AFC) is a wholly-owned subsidiary of the state-owned Philippine National Oil Company (PNOC). It has been endowed the primary responsibility for this project, and the coordination of relevant agencies. The Office of the Government Corporate Counsel Opinion No. 285 of 29 December 2006 affirms PNOC-AFC's role as a direct investor. With respect to bioethanol production, the Department of Energy (DOE) estimates that the required production capacity is 25 plants, each with the annual production capacity of 30 million litres. Various figures are predicted according to the type of ethanol used. For the first and second years of implementing the E5 blend for example, 268 million litres of bioethanol will be required, necessitating an additional investment of US\$ 269 million for the construction of nine new processing plants. The land required for this will be 63 810 hectares. For the E10 blend, after eight years, 171 667 hectares of land is needed to produce 721 million litres, and US\$ 200 million will be required to meet these figures through the construction of new processing plants.

Following this initial overview of the energy sector and the current use and future potential of bioenergy in the Philippines, the main legal and institutional framework for bioenergy are discussed in the following section focusing on the new Biofuels Act. The chapter then outlines other relevant laws and policies and embarks on an analysis of the legal framework for bioenergy in the Philippines. Thereafter some final observations and conclusions are rendered.

2. THE MAIN LEGAL AND POLICY FRAMEWORK FOR BIOENERGY

The Biofuels Act was passed by the Senate and the House of Representatives (Thirteenth Congress, Third Regular Session) on 29 November 2006 and approved by the President on 12 January 2007. It took effect on 6 May 2007,

after the mandatory period of notice to the public through publication. The Implementing Rules and Regulations, prepared by the Department of Energy, took effect on 8 June 2007.

Under the Biofuels Act, the term biofuel is used to refer to "bioethanol and biodiesel and other fuels made from biomass and primarily used for [auto]motive, thermal power generation, with quality specifications in accordance with Philippine National Standards" (section 3(f)). The Act has been expected to have several positive impacts in the Philippines. As markets for biofuels and mandatory blending requirements are established through legislation, private sector investments in production and infrastructure support facilities for biofuels are expected to jumpstart, thereby increasing economic activity in the country and in particular, boosting rural employment. At the same time, the Biofuels Act seeks to contribute in improving air quality with the use of clean energy sources and the mitigation of greenhouse gas emissions.

2.1 Institutional framework

The principal institution responsible for the implementation of the Biofuels Act is the Department of Energy. Within three months from the entry into force of the Biofuels Act, the department was required to: formulate implementing rules for the Act; prepare the National Biofuels Programme, consistent with the Philippine Energy Plan (that also includes the establishment of support facilities to ensure the security of feedstock supply and investments in supply infrastructure); provide directions on the availability of alternative fuel technologies for vehicles, engines and parts; identification viable feedstock other than molasses, sugarcane, cassava, coconut, jatropha, sweet sorghum for the production of biofuels; define technical fuel quality standards, which comply with the Philippine National Standards; draft guidelines for the transport, storage and handling of biofuels; halt the sale of non-compliant biofuels and biofuel-blended gasoline and diesel; and organize an information campaign to promote the use of biofuels (section 7).

The Biofuels Act also establishes a National Biofuel Board (NBB) under section 8. The NBB is composed of the Secretary of the DOE as Chairman, and representatives from the: Department of Trade and Industry; Department of Science and Technology; Department of Agriculture; Department of Finance; Department of Labour and Employment; Philippine

Coconut Authority, and Sugar Regulatory Administration. The Board is assisted by a Technical Secretariat, whose powers and functions are essentially two-fold: monitoring implementation and recommending policy directions (section 9). The Board is tasked with monitoring the Biofuels Programme, and the supply, use and availability of biofuels; and making recommendations regarding adjustment of the mandatory blending requirements, the availability of alternative fuel technology, and the use of biofuels in air transport.

The various government agencies represented on the Board have been given specific mandates corresponding to the different aspects of the law's implementation (section 11). The Department of Agriculture is required to develop a National Programme for Feedstock Supply; it shall thus ensure the increased production and sustainability of supply of biofuel feedstock. Information on available areas suitable for the cultivation and production of such crops shall also be published by this department. The Sugar Regulatory Administration and the Philippine Coconut Authority are charged, *inter alia*, with developing and implementing policies in support of the Philippine Biofuel Programme. The Department of Finance, through the Bureau of Internal Revenue and the Bureau of Customs, is responsible for the monitoring of the production and importation of biofuels. The Department of Science and Technology and Department of Agriculture are tasked with identifying and developing viable feedstock for the production of biofuels. The task of developing and implementing a research and development programme on biofuel production and utilization technology is given to the Department of Science and Technology, through the Philippine Council for Industry and Energy Research and Development. With respect to labour and employment aspects of implementation of the Biofuels Act, the Department of Labour and Employment is responsible for promoting livelihood opportunities and facilitating employment. To address the various trade considerations related to the World Trade Organization and ASEAN Free Trade Area agreements, the Tariff Commission is responsible for creating and classifying a tariff line for biofuels and biofuel-blends. Local government units (provinces, cities, municipalities and barangays or villages) are mandated to assist the Department of Energy in monitoring the distribution, sale, and use of biofuels and biofuel-blends.

2.1.1 Stakeholder participation

The Philippine Constitution expressly provides for public participation at all levels of decision-making. Article XIII(16) stipulates that "The right of the people and their organizations to effective and reasonable participation at all levels of social, political, and economic decision-making shall not be abridged. The state shall, by law, facilitate the establishment of adequate consultation mechanisms." The Biofuels Act mandates that the formulation of its implementing rules and regulations must be conducted in consultation with the National Biofuels Board, stakeholders and the other concerned agencies (section 15). The Biofuels Act also provides that prior to its entry into force, the draft of the implementing rules shall be posted on the Department of Energy website¹⁴⁰ for at least one month and published in at least two newspapers of general circulation.

The role of the private sector is critical in the implementation of the law as the government relies on private investments to produce and market biofuels, and to invest in infrastructure support facilities. The responsibility for fuel-blending, distribution and marketing of biofuels is also vested in privately-owned oil companies. The law thus lays down incentives to encourage investments in the production, distribution and use of biofuels in section 6 (see section 2.3 below). According to the Energy Secretary,¹⁴¹ as of September 2007, there are projects in the pipeline worth of approximately 12 billion Philippine Pesos to construct bioethanol production plants estimated to produce 240 million litres of bioethanol annually. This figure is considered sufficient to satisfy the estimated annual demand of 223 million litres for the 5 percent mandatory blending requirement for bioethanol by 2009.

In contrast to the recent trends in environmental legislation, there are no civil society or private sector representatives in the policy making body, the National Biofuels Board. This is a critical gap especially because the success of the law hinges entirely on private sector participation and investment in biofuel production, distribution and use.

¹⁴⁰ For more information, see www.doe.gov.ph.

¹⁴¹ 27 December 2007, for more information see www.gmanews.tv.

2.2 Market regulations and standards

The mandatory blending requirements for biofuels in gasoline and diesel are implemented according to the timetable (reproduced in Box 1 below) in accordance with section 5 of the Biofuels Act.

Box 1: Timelines for mandatory blending requirements

Activity	Deadline
Phase-out of the use of harmful gasoline additives and/or oxygenates	November 2007
Mandatory minimum 1 percent biodiesel blend in all diesel engine fuels sold	August 2007
Minimum of 2 percent biodiesel blend, upon recommendation of NBB	May 2009
Minimum of 5 percent bioethanol blend in all gasoline fuel sold and distributed	May 2009
Minimum of 10 percent bioethanol blend in all gasoline fuel sold and distributed, upon the recommendation of the NBB	May 2011

The Act provides that the National Biofuel Board may adjust the blending requirements, subject to the condition that the minimum blend may be decreased only within the first four years of implementation. Thereafter, the minimum requirements of 5 percent and 2 percent for bioethanol and biodiesel respectively, shall not be decreased (section 9(c)).

Under the law, in the event of supply shortage of locally produced bioethanol within four years of implementation of the Act, oil companies are allowed to import bioethanol and benefit from a reduced tariff but only to the extent of the shortage as determined by the National Biofuel Board (Implementing Rules and Regulations, Republic Act No. 9.367, sections 5 and 6).

Any individual or entity intending to engage in the production of biofuels shall apply for accreditation as a biofuel producer with the Department of Energy. The department, in consultation with stakeholders, is mandated to issue appropriate guidelines, indicating the requirements for quality assurance, quality management system, and analogous quality production standards (Implementing Rules and Regulations, section 23.1). Moreover, all biofuels producers are required to register their distributors with the

department, as well as submit monthly reports on production, sales, inventory and weekly price of biofuels (Implementing Rules and Regulations, section 23.2).

The blending of biodiesel and bioethanol with diesel and gasoline fuels respectively, shall be the responsibility of oil companies, using appropriate blending methodologies at their respective refineries, depots or blending facilities, in accordance with duly accepted international standards as well as guidelines issued by Department of Energy, and consistent with the Philippine National Standards (Implementing Rules and Regulations, section 22.1).

2.3 Incentives

To encourage investment in the production, distribution and use of locally produced biofuels, the Biofuels Act contains several incentives detailed in section 6. These include tax exemption for the biofuel component of blended gasoline and diesel, and exemptions from wastewater charges imposed under section 13 of the Clean Water Act, Republic Act No. 9275 for water effluents from biofuels production. The sale of raw materials used in the biofuel production are exempt from the value added tax under the National Internal Revenue Code, as amended by the Expanded Value Added Tax Reform Law of 2005. Finally, government financial institutions provide high priority financing to Philippine citizens or entities engaged in production, storage, handling and transport of biofuel feedstock, and the blending of biofuels. These incentives are additional to those already provided by the Board of Investments in accordance with Omnibus Investment Code of 1987 (Executive Order No. 226).

2.4 Environmental and social guarantees under the Biofuels Act

The National Biofuel Board has declared that one of the advantages of biofuels is that they are relatively harmless to the environment if spilled. The NBB indicates that while fossil fuels contain complex and toxic compounds, biodiesel refined from pure vegetable oil contains only simple organic compounds that are non-toxic and biodegradable, making it safe to store and handle. It also estimates that using biodiesel in place of petroleum diesel

decreases carbon dioxide emissions (greenhouse gases) by nearly 80 percent.¹⁴² The Board, however, has not identified the source of its estimates.¹⁴³

Significantly, the Biofuels Act does not provide the Department of Environment and Natural Resources any specific mandate concerning its implementation. The law nevertheless provides that in establishing standards and guidelines for technical fuel quality of biofuels and biofuel-blended gasoline and diesel for the market, the Department of Energy must ensure that these standards comply with the Philippine National Standards for fuel and fuel-related products (section 7(c)). However, the Biofuels Act also provides that the application of water effluents in biofuel production, while exempt from waste water charges, shall conform to guidelines issued pursuant to the Philippine Clean Water Act, subject to the monitoring and evaluation of Department of Environment and Natural Resources.

With respect to the social impact of the law's implementation, the Biofuels Act lists various responsibilities for the Department of Labour and Employment to ensure certain social guarantees. With the expected investment in biofuel production, the Department of Labour and Employment is responsible for promoting livelihood opportunities and productive employment; ensuring the access by workers to productive resources and social coverage; and making recommendations for plans, policies and programmes that will enhance the positive social impacts of the National Biofuels Programme (section 11(e)).

The Biofuels Act further contains provisions on the non-forfeiture or diminution of existing benefits for sugar workers where sugarcane is used as feedstock (section 17). Under the Republic Act No. 6982, also known as the Sugar Amelioration Act of 1991, the sugar workers enjoy a form of production sharing. The Sugar Amelioration Act provides that effective from sugar crop year 1991–1992, a lien of 5 Philippine pesos per *piccolo* of sugar shall be imposed on the gross production of sugar in order to increase the income of sugar workers and also to finance social and economic programmes to improve their livelihood and well-being. This is subject to an automatic additional lien of 1 Philippine peso every two years for the following ten years (Republic Act No. 6982, section 7). According to the Biofuels Act, the NBB is responsible for establishing a similar mechanism for biofuel workers (section 17). While the labour and social guarantees to

¹⁴² For more information see www.doe.gov.ph.

¹⁴³ For more information see www.doe.gov.ph.

sugarcane workers have been specified, it is hard to assess the adequacy of these guarantees in practice outside the black-letter law.

The law does not address the question of land rights and transparency of land agreements, for example between local or indigenous communities, with respect to the land and water resources to be used for the cultivation of energy crops.

2.5 Bioenergy research and development

Ongoing research and development on biofuel production and utilization is the responsibility of the Department of Science and Technology (DOST) which is also tasked with publishing and promoting related technologies, developed locally and abroad. DOST, through the Philippine Council for Industry and Energy Research and Development (PCIERD), has developed a roadmap for all research and development (R&D) activities for the development of biofuels. The Biofuel R&D programme that PCIERD has submitted to the Biofuels Board establishes the science and technology infrastructure support for the Biofuel Act that will cover: biofuel technology research, assessment, validation and documentation; alternative feedstock identification and development; feedstock raw material and biofuel analysis; performance testing of biofuels from different feedstocks; techno-economic viability assessment of biofuel production plants; and technology promotion and transfer.¹⁴⁴

Even prior to the Biofuels Act, DOST had undertaken research projects on biofuels production. In May 2005, PCIERD formally launched the first DOST-assisted biofuel plant, with three test vehicles loaded with the first ever coco- methyl- ester (CME) produced by the newly opened CME plant, demonstrating the clean burning, non-toxic, and superior lubricity and detergent properties of CME. A one-tonne capacity CME plant called Romtron Philippines in Romblon Province was started in 2001.¹⁴⁵

DOST and the Philippine Council for Agricultural Resources Research and Development have signed the Memorandum of Agreement for the Integrated Research and Development Programme dated 1 June 2007 that called for studies on jatropha for biodiesel and the utilization of sweet sorghum and cassava as feedstocks for ethanol production. The Integrated

¹⁴⁴ For more information see www.pcierd.dost.gov.ph.

¹⁴⁵ Ibid.

Research and Development Programme on Biofuels aims to provide science-based production and post-production information and technology in support of an Environmental Science and Technology Agenda and the Biofuels Act.

2.6 Penalties for violations

The Biofuels Act lists several prohibited acts that are applicable to producers and distributors, but not the end users (section 12). The diversion of locally produced or imported biofuels for purposes other than those envisioned in the Act is prohibited as is the sale of biofuel-blended gasoline or diesel that fails to comply with the minimum biofuel-blend by volume in violation of the requirements. Specifically the distribution, sale and use of automotive fuel containing harmful additives such as, but not limited to, Methyl-Tertiary-Butyl-Ether at such concentrations exceeding the limits to be determined by the National Biofuels Board is outlawed. Other offences under the act include non-compliance with established guidelines by the Philippine National Standards and DOE for the implementation of the Act, and the false labelling of gasoline, diesel, biofuels and biofuel-blended gasoline and diesel.

The Biofuels Act imposes penalties of imprisonment ranging from one to five years and a fine ranging from 1 million to 5 million Philippine pesos as penalties, as well as the confiscation of non-compliant products (section 12).

3. BIOENERGY-RELATED LAWS AND POLICIES

3.1 International legal instruments

Under the Philippine Constitution, it is a declared principle that the Philippines will adopt generally accepted principles of international law as part of the law of the land (Art. II(2)). The Constitution likewise states that no treaty or international agreement is valid and effective unless concurred by at least two-thirds of all the members of the Senate (Art. VII(21)).

The Philippines is party to the following international instruments relevant to bioenergy: the United Nations Framework Convention on Climate Change (signed on 12 June 1992 and ratified on 2 August 1994); the Kyoto Protocol (signed on 15 April 1998 and ratified on 22 November 2003); the

Convention to Combat Desertification (signed on 8 December 1994 and ratified on 10 February 2000); and the Convention on Biological Diversity (signed on 6 June 1992 and ratified on 8 August 1993). The Philippines has also been a member of the World Trade Organization since 1 January 1995.

The Philippines has passed legislation aimed at addressing climate change, namely the Clean Air Act of 1999 and the Solid Waste Management Act of 2000, both of which regulate the emissions of greenhouse gases. In line with its commitments under the Convention on Biological Diversity (CBD), the Philippines passed the National Integrated Protected Areas System Act (Republic Act No. 7586) which provides a framework for setting aside portions of forestlands as protected areas and regulates activities in these areas to protect biodiversity. For example, the conversion of forests to plantations is prohibited in these areas.

The Biofuels Act paved the way for the Philippines to push for the Cebu Declaration on East Asian Energy Security, adopted by the 16 heads of state of the Association of Southeast Asian Nations (ASEAN) and its dialogue partners during the 12th ASEAN Summit held in the Philippine city of Cebu on 15 January 2007. This is a declaration of commitment by the ten ASEAN states to work closely together towards: improving efficiency and environmental performance of fossil fuels; reducing dependence on conventional fuels through intensified energy efficiency and conservation programmes, hydropower, expansion of renewable energy systems and biofuel production and utilization (and for interested parties, nuclear energy); encouraging open and competitive regional and international markets geared towards providing affordable energy at all economic levels; mitigating greenhouse gas emission through effective policies and measures; and pursuing investment on energy resource and infrastructure development through greater private sector involvement. Under this declaration, follow-up and implementation measures will be undertaken through existing regional mechanisms in close consultations with the dialogue partners, including China.

3.2 Clean Development Mechanism

The Biofuels Act explicitly provides that its provisions shall not be interpreted as prejudicial to CDM projects that reduce the emissions of carbon dioxide and other greenhouse gasses by means of biofuels use (section 18). This provision should be understood in light of the requirement adopted by the Parties to the Kyoto Protocol that CDM projects must be

"additional" to projects that would be implemented without the CDM. In other words, projects registered under the CDM must not fall under the "business as usual" scenario in the country, for instance, concerning the setting up of biofuel plants.¹⁴⁶ This provision in the Biofuels Act attempts to pre-empt the satisfaction of the 'additionality' criterion for qualification under the CDM (see Chapter 1.2.2 of this study), of biofuel projects in the Philippines by the CDM Executive Board. At best it clarifies that, while biofuel projects are encouraged and are becoming numerous, these projects are still not the norm in the country.

The Designated National Authority for the CDM is the Department of Environment and Natural Resources, pursuant to Executive Order No. 320 of 25 June 2004, while the Department of Energy takes the lead role in evaluating energy-related projects prior to their endorsement and registration with the CDM Executive Board. Of the 39 registered CDM projects in the Philippines a majority involve biomass energy.¹⁴⁷ Several projects pertain to electricity generation from methane recovered from animal wastes, the production of biogas (some will generate electricity from bagasse), while the remaining cover geothermal energy production, wind energy production and sinter cooler waste heat recovery power generation.

The San Carlos Renewable Energy Project will produce electricity from bagasse, a waste product from producing ethanol from sugarcane. Its expected annual emission reductions are estimated at 37 658 metric tonnes of carbon dioxide equivalent.¹⁴⁸ The facility will produce 125 000 litres of bioethanol annually, intended for blending with gasoline, in line with the Biofuel Programme under the Biofuels Act.

3.3 Renewable energy

As a long-term strategy, the Philippines is exploring and developing renewable energy sources. Based on current projections of the Department of Energy, renewable energy is estimated to meet up to 40 percent of the country's primary energy requirements over the ten-year period beginning in 2003. Although its share will decline in relation to the total figure, it is estimated to grow at an average annual rate of 2.4 percent in absolute terms. Biomass, micro-hydro, solar and wind will remain the largest contributors to

¹⁴⁶ Kulheim, R. 2006.

¹⁴⁷ For further statistical information see www.unfccc.int.

¹⁴⁸ Ibid.

the total share of renewable energy in the energy mix with an average share of 27.5 percent. Meanwhile, hydro and geothermal power will contribute to the energy balance and continue to be a significant source of electric power.¹⁴⁹

The Renewable Energy Act of 2008 (Republic Act No. 9531) lays down the framework for the accelerated development and advancement of renewable energy resources, through the grant of fiscal and non-fiscal incentives and the development of a strategic programme to increase its utilization. Such sources include (but are not limited to) biomass, solar, wind, hydro, geothermal and ocean energy sources and do not have an upper limit on the total quantity to be used as their renewal rate is relatively rapid over an indefinite period of time. The Act defines "biomass energy systems" as those which "use biomass resources to produce heat, steam, mechanical power or electricity through either thermochemical, biochemical or physico-chemical processes, or through such other technologies which shall comply with prescribed environmental standards pursuant to this Act." The Department of Energy in particular encourages the adoption of waste-to-energy technologies (section 30), which are systems for converting biodegradable materials such as animal manure or agricultural waste into useful energy. Waste-to-energy technologies are subject to the provisions of the Clean Air Act and the Ecological Solid Waste Management Act. The law also expressly stipulates that DOE must coordinate with the Department of Environment and Natural Resources (DENR) in application of this provision.

A Renewable Portfolio Standard (RPS) is established by the Act under which all stakeholders in the electric power industry must contribute to the growth of the renewable energy industry (section 6). The minimum percentage of electricity generation from renewable sources is to be set by a National Renewable Energy Board (NREB). A Renewable Energy Registrar is tasked with issuing renewable energy certificates corresponding to energy generated from eligible facilities; these certificates are to be used to demonstrate compliance with the RPS (section 8).

Other renewable energy strategies detailed in the statute include the 'green energy option' programme, in section 9 that allows consumers to choose renewable energy as their source of energy. Electricity providers are mandated to provide mechanisms for the physical connection and

¹⁴⁹ See www.doe.gov.ph.

commercial arrangements necessary to ensure the success of the programme. The Department of Energy (DOE), as the lead agency under the law, is responsible for drawing up applicable rules and regulations governing the programme. The law also indicates that electricity distribution utilities shall enter into net-metering agreements with qualified end-users who will be installing the renewable energy system (section 10) and contains provisions on electricity transmission and the development of distribution systems. Under the law the government is entitled to a one percent share of the gross income of the sale of renewable energy by resource developers, but waives this figure in the case of micro-scale projects and non-commercial operations (section 13).

The Act also creates a feed-in tariff system for electricity produced from renewable energy sources (section 7). The law entrusts the formulation of feed-in tariff system rules to the National Renewable Energy Board, including priority connections and purchases, and determinations of the fixed tariff to be paid. NREB is composed of representatives of the energy, trade, finance and environment line ministries as well as electrical supply companies (both public and private), electric cooperatives and NGOs that are endorsed by their respective industry associations. The primary tasks of this body are the recommendation of specific actions to facilitate implementation of the National Renewable Energy Programme and monitoring the utilization of the Renewable Energy Trust Fund created under the law.

Section 14 of the Act on environmental compliance stipulates that all renewable energy exploration, development, utilization and systems operations are to be conducted in compliance with environmental regulations laid down by DENR or other concerned government agency. In addition, the renewable energy developer must secure an Environmental Compliance Certificate from the corresponding regional office of DENR.

Chapter VII of the Act sets out the incentives scheme for renewable energy. Incentives are created for farmers engaged in the plantation of biomass resources (section 22). For a period of ten years following the coming to force of the Act, persons engaged in the plantation of crops used as biomass resources and is certified by the Department of Energy, are entitled to duty free importation and to be exempted from VAT on all types of agricultural inputs, equipment and machinery. Other incentives include, *inter alia*:

- tax and duty-free importation of components, parts and materials;
- tax credit on domestic capital components, parts and materials;
- tax exemption for carbon credits;
- income tax holiday and exemption for developers, manufacturers, fabricators and suppliers of locally-produced renewable energy equipment, components and materials;
- additional incentives for developers, such as special realty tax rates on equipment and machinery, accelerated depreciation, exemption from the universal charge and zero-rated value added tax; and
- access to the 'net-operating-loss carryover scheme' for renewable energy developers, where by net operating loss during the first three years of commercial operation can be carried over as a deduction from gross income for the next five consecutive taxable years following the year of such loss.

3.4 Environmental legislation

The Environmental Impact Statement System, that was passed in June 1978 through Presidential Decree No. 1586, sets the framework for environmental regulations. The decree requires all agencies of the national government as well as private corporations and entities to prepare an environmental impact assessment for every proposed project and undertaking which can significantly affect the quality of the environment (section 2). Pursuant to the decree, the President issued the Presidential Proclamation No. 2146, which declares certain areas and types of projects as environmentally critical. Heavy industries, resource intensive activities and infrastructure projects, as well as development activities on prime agricultural lands, among others, fall within the scope of the environmental impact statement system. Proponents of such projects are required to submit an environmental impact statement, after conducting an assessment, detailing the following: (i) the environment impact of the proposed action, project or undertaking; (ii) any adverse environmental effect which cannot be avoided, should the proposal be implemented; (iii) alternative to the proposed action; (iv) a determination that the short-term uses of natural resources are consistent with the maintenance and enhancement of the long-term productivity of the same; and (v) whenever a proposal involves the use of depletable or non-renewable resources, a finding must be made that such use and commitment are warranted. Before an environmental impact statement is issued by a lead agency, all agencies having jurisdiction over, or special expertise on, the subject matter involved: they

must comment on the draft environmental impact statement made by the lead agency within 30 days from receipt of the same.

In addition to the general framework law on environmental impact assessment, the Philippines passed several sector-specific laws covering clean air, clean water, solid waste management, wildlife, protected areas and hazardous wastes, among others. In relation to the implementation of the Biofuels Act, the Clean Air Act and the Clean Water Act are particularly relevant.

Under the Philippine Clean Air Act of 1999 (Republic Act No. 8749), the Department of Transportation and Communication (DOTC) is responsible for implementing emission standards for motor vehicles in accordance with the aforesaid law (section 21(a)). The Department of Environment and Natural Resources, in collaboration with the DOTC and Local Government Units, will develop an action plan for the control and management of air pollution from motor vehicles consistent with the Integrated Air Quality Framework (section 21 (b)). The DOTC, together with the Department of Trade and Industry (DTI) and the DENR, will establish the procedures for the inspection of motor vehicles and the testing of their emissions for the purpose of determining the concentration and/or rate of pollutants discharged by said sources (section 21(c)). In order to ensure the substantial reduction of emissions from motor vehicles, the DTI, together with the DOTC and the DENR shall formulate and implement a national motor vehicle inspection and maintenance programme that will promote efficient and safe operation of all motor vehicles (section 21(d)). The Implementing Rules and Regulations of the Biofuels Act (section 19) reiterate this mandate as a measure to substantially reduce emissions, pursuant to the Philippine Clean Air Act of 1999.

The implementation of the Biofuels Act is necessarily linked to the provisions of the Clean Air Act. In accordance with the objective of the Clean Air Act to develop and utilize cleaner alternative fuels, a Technical Committee on Petroleum Products and Additives under the Department of Energy prepared a Philippine Coconut Oil Biodiesel Product Standard and adopted the Philippine National Standard (PNS) for Biodiesel by the Bureau of Product Standard. Manufacturers must comply with the latter to ensure its effectiveness when used either in its pure state or as a blend. Such a standard has the force of law, having been issued pursuant to powers delegated by the Congress to the concerned agencies under the law. The standard was based

in part on a study of the Department of Science and Technology, where it was stated that: that biodiesel (fatty-acid alkyl-ester) is a cleaner-burning diesel replacement fuel made from natural, renewable and biodegradable sources; it is a stable diesel substitute, which performs reliably in all diesel engines without any modification; is mixable with petroleum diesel fuel; it is easy to make and safe to handle. Biodiesel cuts emissions as it reduces particulates, unburned hydrocarbons, carbon monoxide and carbon dioxide; and it is free from lead, sulphur and halogens. Biodiesel, therefore, is considered a very promising alternative fuel that can lead to a cleaner environment.¹⁵⁰

The production of biofuels has implications on water discharges and effluents, which may be a source of water pollution. As explained above, the Biofuels Act exempts biofuel investors from wastewater fees. However, they are not exempt from the obligation to secure a discharge permit. Under the Clean Water Act (Republic Act No. 9275), the DENR requires owners or operators of facilities that discharge regulated effluents to secure a permit to discharge (section 14). The discharge permit constitutes a legal authorization granted by the DENR to discharge wastewater. Moreover, the discharge permit specifies, among other things, that the quantity and quality of effluent that these facilities are allowed to discharge into a particular water body, must adhere to schedule and monitoring requirements. While biofuel plants are exempted from the discharge fees, their effluents are still subject to the standards set by the DENR, pursuant to the Clean Water Act, and further subject to its monitoring. The exemption only applies if the company meets the effluent standards. Such exemption may very well provide an incentive to biofuel producers to comply with the standards of the DENR in order to qualify and avail of such exemption from payment of wastewater fees.

With regards to the cultivation of energy crops such as sugarcane for bioethanol production or jatropha for biodiesel production, it should be noted that the Philippines has no comprehensive land-use policy or law. Land use is largely determined by local government units through local zoning ordinances within their political jurisdictions. Local government decisions on zoning are mainly concerned about tax rates and identifying areas for urban development. There are no national standards or guidelines on how decisions are to be made by either a national agency or local government on whether farmland is to be used for biofuel or food

¹⁵⁰ Bulan, C. (undated).

production. The Environmental Impact Statement System sets regulations on large-scale plantations (including energy crops such as jatropha) if these are located in public lands (those classified as forestlands or protected areas, regardless of its actual forested condition). Currently, there are no regulations on alien invasive species, although the Wildlife Act mandates the Department of Environment and Natural Resources to develop regulations on this.

3.5 Food and agriculture

It is estimated that the production of biofuels in the Philippines is likely to compete with food production. In terms of sugar supply, the mandate and role of the Sugar Regulatory Administration (SRA) comes into play. Under the Biofuels Act, it is specifically stated that notwithstanding any contrary provision in the Biofuels Act, the SRA shall at all times ensure that the supply of sugar is sufficient to meet the domestic demand and that the price of sugar is stable. To this end, the SRA shall recommend (and the relevant agencies shall undertake) the importation of sugar whenever necessary and shall make appropriate adjustments to the minimum access volume parameters for sugar in the Tariff and Custom Code (section 10).

The challenge for SRA is to establish mechanisms that ensure a sugar demand and supply equilibrium and also to stabilize prices at a level that is reasonable to producers and fair to consumers. As the sugar industry is expected to provide the bulk of feedstock for bio-ethanol production, the challenge is how to meet the demand through the domestic sugar industry through yield improvements and area expansion. The SRA also faces the challenge of setting up the ethanol industry without compromising the country's sugar self-sufficiency. Competition for raw material could also threaten the viability of both the sugar and ethanol industries.¹⁵¹ In terms of ethanol production, the SRA estimates that of the current 385 000 hectares dedicated to sugar production, 20 000 hectares can be shifted to ethanol without compromising self-sufficiency in sugar supply.¹⁵² Again, the Philippines does not have a comprehensive land use law or policy, which could help clarify and delineate land use for biofuel production *vis-à-vis* other land uses to obviate land use competition.

¹⁵¹ Ledesma, J. 2006.

¹⁵² Ibid.

A newly created bicameral oversight committee will hold public hearings on the impact of biofuel farming on land use policy in order to guard against indiscriminate biofuel development.¹⁵³

3.6 International trade

As the Philippines is a member of the World Trade Organization and the Asian Free Trade Association, the Biofuels Act mandates the Tariff Commission to take into account trade considerations in the implementation of the law (section 11(f)). With the mandated use of blended gasoline and diesel with locally produced biofuels, oil imports are expected to be reduced and possibly the country will have an opportunity to export surplus biofuels.

Republic Act No. 8178 replacing quantitative restrictions on agricultural products, came into force in 1996 to implement the tariffication of agricultural products in accordance with WTO Agreement on Agriculture. Executive Order No. 376 provided a general imports duty exemption to eligible agriculture and fisheries enterprises in order to promote and foster their efficiency and global competitiveness. Executive Order No. 449 of 22 July 2005, on the other hand, modifies the rates of import duty specifically for bioethanol fuel under section 104 of the Tariff and Customs Code of 1978. The rationale of this instrument is laid out in its preamble as being in support of a programme that promotes the blend of bioethanol with gasoline. In view of the fact that at the time, "there is currently no local producer of bioethanol fuel, a reduction in tariff [...] would assure the price competitiveness of ethanol-blended gasoline *vis-à-vis* other gasoline products." This product is subject to the Most-Favoured-Nation rate of import duty in accordance with the schedule indicated in Annex A of the Tariff and Customs Code.

The Agriculture and Fisheries Modernization Act of 1997 (Republic Act No. 8435) also exempts enterprises or persons duly certified by the Department of Agriculture in consultation with the Department of Finance and the Board of Investments (BOI) from the payment of import duties of agricultural inputs, equipment and machinery for five years (section 109).

¹⁵³ For more information see www.senate.gov.ph.

3.7 Labour

The Philippine market for biofuels relies upon ethanol and biodiesel. Under the Biofuels Act, sources of feedstock include molasses, sugarcane and cassava for ethanol; while sources for biodiesel include coconut and jatropha, *inter alia* (sections 3(q) and 6(b)). With the mandatory blending requirements spurring investments in the production of biofuels, it is expected that economic activity will increase particularly through agricultural diversification, employment opportunities and increased income for farmers leading to increased rural development. This is in line with the 10-Point Agenda of the Executive Branch on the promotion of labour opportunities and agricultural development. Such agenda primarily lists "the creation of six million jobs in six years via more opportunities given to entrepreneurs, tripling of the amount of loans for lending to small and medium enterprises and the development of one to two million hectares of land for agricultural business."¹⁵⁴ Under the Labour Code of the Philippines, such agricultural workers enjoy the right to self-organization and collective bargaining. However, employment in the bioenergy sector does not only encompass agricultural workers but also includes industrial and other types of employees, for example related to processing activities. Just and humane conditions of work are also guaranteed in light of the minimum working conditions and benefits mandated by the Labour Code. The latter instrument also contains special provisions on the work rights of women and prohibits prohibition of employing minors. Its article 2 on health and safety standards empowers the Secretary of Labor and Employment through appropriate orders, to enforce mandatory occupational safety and health standards to eliminate or reduce occupational safety and health hazards in all workplaces and ensure safe and healthy working conditions in all places of employment.

4. ANALYSIS OF THE LEGAL FRAMEWORK FOR BIOENERGY IN THE PHILIPPINES

4.1 General observations on bioenergy legislation

The Biofuels Act was passed "to reduce dependence on imported fuels with due regard for the protection of public health, the environment, and natural ecosystems consistent with sustainable economic growth that would expand

¹⁵⁴ For more information on the 10 Point Agenda of the Philippine Executive Branch, see www.gov.ph.

opportunities for livelihood..." (section 2). The policy objective underlying the new law thus contained a desirable balance of energy security and sustainable development. The law also provides economic incentives for investment in biofuel production. A cabinet-level monitoring and advisory body, the National Biofuel Board, was created to ensure that the impacts of the biofuel policy are consistent with the goal of balanced economic growth. The law specifically targets the transport sector, which accounts for 46 percent of the country's total oil consumption, which is to use biofuels through mandatory blending requirements for ethanol and biodiesel. Mandatory blending requirements can be said to lead to an increase in investments and economic activities directly and indirectly related to biofuel production. This would likely mean more employment opportunities for farmers and production workers. Social welfare guarantees for workers involved in biofuel production are provided by the statute. The law also explicitly protects the benefits enjoyed by workers (especially in the sugar industry) under other legislation.

Biofuel production is capital intensive and entails considerable financial costs. For instance, in terms of ethanol production, the required capital for the construction of production facilities is estimated at 20–30 billion Philippine pesos (US\$ 0.5 to 0.75 billion) in order to meet the 10 percent blending requirement.¹⁵⁵ On the other hand, with respect to biodiesel production, the financial requirements for production are estimated at 250 million Philippine Pesos (US\$ 6.25 million) to produce 48 million litres of biodiesel (*jatropha*) by 2015. These costs are broken down as follows: plantation at 155 850 million Philippine pesos, procurement centres at 13 830 million Philippine pesos, and transesterification units at 71 000 million Philippine pesos and research and development costs at 10 000 million Philippine pesos.¹⁵⁶

The incentives scheme for the production of alternative fuels under the law serves to decrease the country's dependence on imported oil, in the midst of increasing oil prices on the world market. Reduced importation also means savings in foreign exchange, which the country can instead put towards the payment of loans and for international trade in other sectors.

The government policy on biofuels may be read in the context of a broader renewable energy framework, including the Renewable Energy Act. Implicit

¹⁵⁵ CESDR. 2005.

¹⁵⁶ Kuemar, P. and Paramathma M. Undated.

in the Biofuels Law is that biofuel production must meet environmental regulations such as those on environmental impact assessments. Fuel quality standards, expressed as mandatory biofuel blends are expected to have the effect of producing cleaner emissions, compared with unblended fuels. In this way, mandatory compliance with environmental regulations (with respect to production) and the use of biofuels itself are estimated to result in environmental benefits such as cleaner air and less carbon dioxide emissions.

The state-run Philippine National Oil Company, through its subsidiary the Alternative Fuels Corporation (PNOC-AFC), negotiates with various investors concerning the planting of biofuel feedstocks and construction of biofuel refineries. Its primary mandate is to explore, develop and accelerate the utilization and commercialization of alternative fuels in the country. It is also planning to undertake an initial public offering this year. Part of the preparation for the listing of its shares in the stock exchange is to enter into various joint ventures with both local and foreign firms for the construction of biofuel plants all over the country. One such venture aimed at increasing the value of stockholders' investment in PNOC-AFC is the US\$ 1.3 billion deal with a UK-based bioenergy firm to build biofuel refineries and plantations in the country.¹⁵⁷

The institutional arrangements created under the law with a lead agency and multi-agency cooperation, including local government units, ensures that various interests are considered. All relevant sectors are included in the dialogue at the policy level (through the National Biofuels Board) and at the implementation level, where national agencies and local governments can easily understand and play their roles.

It seems, however, that comprehensive and thorough studies regarding biofuel production that evaluate the impact on land use and address deforestation issues and concerns over competition with food production should be mandated by law, and precede any major biofuels undertaking. There appears to have been inadequate or no comprehensive studies on the impact of the biofuels policy on food security so far, considering that the production of energy crops may compete with food crops for farmland. The social and environmental impacts of biofuels have thus yet to be definitively ascertained. Concerns have been voiced in the Philippines, in particular at an Energy Summit in 2008, over the fact that biofuels production involves forest

¹⁵⁷ For more information, see www.ucap.org.ph.

clearing which releases more carbon dioxide into the atmosphere, and also entails the destruction of biodiversity and fragile ecosystems. Furthermore, lessons about the economic gains to be made in the biofuel sector should be drawn from the 1982 biofuels programme in the Philippines, which was subsequently suspended. This was prompted by a World Bank study,¹⁵⁸ which showed that the domestic resource costs of ethanol production was 15–20 percent higher than the cost of importing oil and refining an equivalent volume of gasoline. While some studies were conducted prior to the enactment of the Biofuels Act as well as DOE projections calculated on foreign exchange savings, clear and transparent assessments of actual savings when the law is implemented are needed.

The Biofuels Act declares as its objective the promotion of environment-friendly fuel alternatives. Interestingly however, the Department for the Environment and Natural Resources (DENR) is not given any specific mandate under the Biofuels Act. Additionally, the Biofuels Act itself is not explicit about environmental guarantees beyond a policy statement to protect the environment and natural habitats. While there are several environmental laws empowering DENR with a view to environmental protection, its absence in the National Biofuels Board, where various sectors are well-represented to ensure the balancing of various interests, could be noted with concern.

4.2 Challenges in enforcement

Several barriers to the implementation of the law have been identified in a study commissioned by the Department of Energy including: modifying engines to run on higher biofuel blends, lowering production costs of ethanol from sugarcane; implementing required infrastructure upgrades (e.g. more ports to accommodate biofuel transport); ensuring the financial viability of biofuels and the real contribution of biofuel to the overall energy mix and to foreign exchange savings. The challenges in developing ethanol-friendly technology for the future in the Philippines have also been identified to include:¹⁵⁹ modification of engines to run on pure ethanol; use of second-generation (cellulosic) feedstock (such as bagasse and corn stover) in ethanol production; design of specialized containers for ethanol as well as appropriate land and water vehicles; port system improvements; increase in

¹⁵⁸ World Bank.1982.

¹⁵⁹ CESDR. 2005.

flame luminosity of ethanol for added detection and control; and achievement of favourable energy balance in ethanol substitution to clinch foreign currency; savings and energy independence; development of cheaper material inputs for sugarcane production (e.g. stillage as fertilizers and pesticide substitutes); and optimization of system integration on the basis of power cogeneration using residue (bagasse) to bring down production costs.

These challenges have been recognized at least since 2005, but may not have all been taken into account in formulation of the Biofuels Act. Sources from the oil industry sector highlight difficulties relating to technical aspects of implementing the law such as blending and percentage requirements, the adequacy and steady supply of coco-methyl-esters (CMEs) in the country, ensuring no damage to vehicles occurs through the use of blended fuels and addressing liability issues where vehicles are damaged in this way.

While the biofuels sector has attracted significant investments to date and with more in the pipeline, present production and supply quantities are still not adequate to meet the ambitious blending targets under the law. Therefore, oil companies are allowed to import tariff-free biofuels, which temporarily negates the benefits expected from foreign exchange savings, increased economic activity and employment opportunities creation.

While the voluntary E10-blend has been available since August 2005, even before the enactment of the law, only a handful of gas stations sold it. It is currently not widely available outside of the greater Manila area. At the time of writing, the 1 percent biodiesel blend is still not available in all pumps all over the country. Thus far, the DOE has accredited three CME manufacturers.

5. CONCLUSIONS

In 2006, the Biofuels Act was heralded as a major step towards ensuring that the Philippines achieve energy security, with the added benefits of increase in employment, foreign exchange savings, and cleaner environment. Given the current under-supply and challenges in implementation, it appears that projections for investments and production, as well as the benefits gained under it, may have been overestimated. At the Energy Summit in January 2008, the lead author of the Biofuels Act, Senator Miriam Santiago, called for deferring the implementation of the law in the light of persistent concerns

over the impact of biofuels production on food security and the environment (land conversions). The quick strides taken towards biofuel promotion and use have been slowed to accommodate a broader perspective on renewable energy and "expand the portfolio of [energy] options."¹⁶⁰

The Energy Summit in January 2008 showed the focus of stakeholders veering towards other renewable energy sources. This direction was confirmed with the passing of the Renewable Energy Act towards the end of 2008. The President of the National Academy of Science and Technology concluded at the Energy Summit that the impact of biofuels on energy security is minimal at 0.3 million tonnes of oil equivalent.¹⁶¹ He added that the greatest benefit generated from the Biofuel Programme is increased employment. Faced with some criticism touched upon in the previous section and the difficulties of meeting the deadlines and mandatory blending requirements for ethanol and biodiesel, the focus is now to include other alternative renewable energy sources. While this more comprehensive strategy is likely beneficial for the country in its cautioned approach toward ambitious biofuels targets and a more holistic approach to renewable energy, it may send a negative signal to investors who are planning to invest or have already invested in the biofuels sector.

Despite the drawbacks highlighted above, the Biofuels Act is a clear legal instrument to enforce specific requirements concerning the production, distribution and use of biofuel blends in the transport sector, in a country seeking to diversify its energy sources away from fossil fuels. The detailed incentives structure of the Renewable Energy Act is further testament to the emphasis on diversification of energy sources evident in its provisions that detail mechanisms of promoting and supporting the utilization and commercialization of alternative energy sources.

¹⁶⁰ The legislative energy agenda, after Davos 2008. Senator Miriam Defensor Santiago, Chair of the Senate Committee on Energy, available at www.doe.ph.

¹⁶¹ Javier, E.Q. 2008.

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F. TANZANIA

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1. INTRODUCTION

This chapter is divided into six sections, the first focusing on Tanzania's energy sector in general and the relevance and potential of bioenergy in Tanzania. Thereafter the influence of international legal instruments on the national legal framework for bioenergy in Tanzania is reviewed. This is followed by a discussion of the domestic policy, legal and institutional frameworks relevant to bioenergy. The final section highlights certain regulatory features of the bioenergy framework and offers some conclusions.

1.1 Bioenergy utilization in Tanzania

Bioenergy plays an important role in Tanzania. Tanzania's energy balance is dominated by biomass-based fuels, particularly fuel-wood (charcoal and firewood) which is the main source of energy for both urban and rural areas. Biomass-based fuel thus accounts for more than 90 percent of Tanzania's primary energy supply. Imported petroleum and hydro electricity account for approximately 8 percent and 1.2 percent of the primary energy consumption respectively. The share of solar and wind energy is about 0.8 percent. Development of natural gas for electricity is also ongoing. The dissemination of renewable energy technologies has been thus far limited to the promotion of improved stoves, improved charcoal production techniques, solar, biogas and windmills and to a lesser extent photovoltaic sources.

A study on Liquid Biofuels for Transportation in Tanzania by the German Agency for Technical Cooperation (GTZ) in 2005, indicated that the use of liquid biofuels from energy crops is almost non-existent.¹⁶² In rural areas where jatropha is planted, jatropha oil is used in small lamps and for making soap with the help of local non-governmental organizations. The study also revealed that the price of jatropha oil was US\$ 2 per litre, which is more expensive than diesel fuel; thus there is no economic incentive for using jatropha oil as a substitute for diesel. With regard to other types of biofuels, the GTZ study indicates that Tanzania has the potential to produce biofuels from other sources, including starch crops such as grains, maize and tubers like cassava, sugar plants such as sugar cane, cellulose plants (agricultural residue) and other oil seeds such as cotton, moringa and pongenia.

¹⁶² GTZ. 2005.

1.2 Potential for bioenergy and concerns

Tanzania is frequently cited as a country with the potential to become a significant biofuels producer from energy crops.¹⁶³ This is due to its favourable geographical location: having borders with eight countries and access to the Indian Ocean, Tanzania offers a good gateway for biofuels to external and internal markets. It may also be linked to Tanzania's ideal agro-climatic conditions for growing a wide range of suitable crops, including sugar cane, palm oil, jatropha, soy and cotton. Another reason is the availability of land: Tanzania has over 88 million hectares of suitable agricultural land of which less than ten per cent is currently utilized. Furthermore, most of this land is not virgin forest or otherwise environmentally sensitive. Tanzania is also endowed with three of the world's ten largest lakes, has a large network of rivers, all of which comprise significant irrigation sources. Furthermore, the availability of local expertise and institutions created through the support of international development partners as well as the National Biofuels Task Force provides the opportunity to harness this bioenergy potential.

In addition, there are a number of local entrepreneurs and corporate groups who have expressed interest in investing in biofuels. The government, through the Tanzania Investment Centre, has also identified the energy sector as a priority sector. This means that a number of incentives available for investments in the energy sector can be extended to biofuels, such as zero percent import duty on capital goods, Value Added Tax (VAT) deferment, land rent reduction as well as zero-rated VAT on exports.¹⁶⁴

The current move towards biofuel production in Tanzania is necessitated by a number of factors, which are analogous to the concerns in the rest of the world. Notably, being dependent on oil imports, Tanzania has been affected by price increases of petroleum products on the world market. A study indicated that the value of Tanzania's oil imports rose from US\$ 1 661.4 million in 2002 to US\$ 2 145.4 million in 2003. In 2006, the import of petroleum accounted for 40 percent of all imports with 40 percent of this figure going towards the transport sector alone. The continuous increase in oil prices is a heavy burden for the country and by reducing its oil imports, Tanzania would make savings in foreign exchange and thus improve its balance of payments. Other reasons supporting the production and use of

¹⁶³ Keamey, A.T. 2006.

¹⁶⁴ For more information, see www.tic.co.tz.

biofuels in Tanzania include the need to diversify energy sources and technologies and to improve energy security. This could also promote the development of new agricultural markets and income generation in rural areas, as well as reduce greenhouse gas emissions and air pollution from carbon dioxide, sulphur dioxide and particulate matter.¹⁶⁵

There is a growing interest in the production of biofuels from both local communities and international actors, especially investor-multinationals fuelled by the growing national and international political will and support. Potential markets for biofuels are found at all levels – in households, and the industry and transport sectors. Tanzania has also ratified the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) and could benefit from the Clean Development Mechanism.¹⁶⁶

Some concerns have been voiced worldwide and echoed in Tanzania regarding the impact of the increasing commercial production of biofuels. In most cases the concerns have been raised by members of Parliament and observer organizations through workshops and articles in the media. The perception of many is that the commercial pressure to maximize crop yields could force food production off the best land to make way for biofuels, thus leading to competition between the production of biofuels and other productive uses of land.¹⁶⁷ Tanzania is not producing biofuels for export yet. However, the move towards biofuel production has been criticized due to concerns relating to human rights abuses, such as land conflicts, land grabbing and eviction, and indecent working conditions on plantations.¹⁶⁸

As a developing country, Tanzania lacks the necessary technology for the production of biofuels and capital investment. This being the case, the country currently encourages foreign investment in biofuels and the likelihood of foreign investors dominating the industry should not be underestimated.¹⁶⁹ It is, however believed that this issue has been given due consideration by the National Biofuels Task Force (discussed in section 5.1 below) while formulating the Draft Guidelines for Biofuels Development in Tanzania; in part as a result of the multi-sector composition of the Task Force.

¹⁶⁵ Janssen, R. 2006.

¹⁶⁶ Sawe, E.N. 2008.

¹⁶⁷ Bailey, R. 2008.

¹⁶⁸ For more information see www.oxfamint.org.in.

¹⁶⁹ Ibid.

1.3 Bioenergy operating companies

With the exception of very few biofuel projects recently registered with the Tanzania Investment Centre geared towards large-scale commercial production, the biofuel industry in Tanzania relies on smallhold farming on the basis of contracts.¹⁷⁰ The industry is characterized by contract-farming or agreements with farmers whereby seeds and other agriculture inputs are provided by companies who can then purchase the crops produced by the farmers.

Different actors are at various stages of developing and promoting the production of biofuels.¹⁷¹ For example, one group is working on the production of bioethanol from sugarcane; foreign companies are producing jatropha in Mpanda–Rukwa, in Biharamulo and Kagera, in Arusha and Dar es Salaam. Other foreign companies are dealing with oil palm in Kigoma, and foreign and local firms are dealing in jatropha oil.

2. INTERNATIONAL INITIATIVES RELEVANT TO BIOENERGY

2.1 International legal framework

Tanzania is party to the United Nations Framework Convention on Climate Change (UNFCCC) (ratified on 17 April 1996) and its Kyoto Protocol (ratified on 26 August 2002); the Convention to Combat Desertification (UNCCD) (ratified in 1997); and the Convention on Biological Diversity (CBD) (ratified on 8 March 1996). Tanzania has also been a member of the World Trade Organization (WTO) since 1995. At regional level, Tanzania is a party to two important regional blocks, namely the Southern African Development Community (SADC) and the East African Community (EAC).

2.1.1 Clean Development Mechanism in Tanzania

The Vice President's Office, Division of Environment, acts as Tanzania's Designated National Authority (DNA) for the Clean Development

¹⁷⁰ Malema, B.A. and Mfugal, E.O. 2008.

¹⁷¹ Bioenergy Policies for Sustainable Development in Africa. Competence Platform on Energy Crop and Agroforestry Systems for Arid and Semi-arid Ecosystems – Africa. 25-27 November 2008, Bamako, Mali.

Mechanism (CDM).¹⁷² According to national CDM guidelines, in order for a project to be approved, it has to be in line with the National Strategy for Growth and Reduction of Poverty (NSGRP) and aim at poverty alleviation by generating employment and improving the standard of living. Another requirement is that the proposed CDM project needs to be consistent with the Tanzanian Development Vision 2020. The project must be consistent with the Environmental Management Act (2004) and the related Environmental Impact Assessment Regulation (2005). This means that issues relating to resource sustainability, resource degradation, impact on biodiversity and other environmental issues must be accounted for. In addition, CDM project activity should lead to transfer of environmentally sound technology.¹⁷³

The only CDM project registered in Tanzania thus far is the landfill gas recovery for electricity generation project at the Mtoni Dumpsite, Dar es Salaam (ref. 908). Other projects in the pipeline include: Tanzania Planting Company of Moshi for biogas cogeneration; the 200 MW Singida Wind Farm, a project relating to power production from sisal waste biogas and a biomass cogeneration project (17.5 MW).¹⁷⁴

Capacity building initiatives for the CDM

Owing to the fact that CDM projects are primarily implemented by the private sector and other non-governmental actors, the Tanzanian Government is expected to continue to provide an enabling environment for stimulating CDM projects.¹⁷⁵ Tanzania has undertaken some capacity building activities under the UNFCCC and the Kyoto Protocol. It prepared the National Adaptation Programme of Action (NAPA) and conducted an in-depth analysis of climate change impacts in the agriculture, health and water sectors. Tanzania has also prepared guidelines for the implementation of the CDM and a handbook for CDM project activities in Tanzania.

In order to help Tanzania in implementing CDM projects that are in line with the national sustainable developments goals, particularly projects in the energy sector, the UNEP Risoe Centre on Energy, Climate and Sustainable Development (URC) launched a project on Capacity Development for the

¹⁷² For more information see www.cdm.or.tz.

¹⁷³ Tanzania Clean Development Mechanism Implementation Guide. 2007.

¹⁷⁴ For more information see www.cdm.or.tz.

¹⁷⁵ Mfugale, D. 2008.

Clean Development Mechanism (CD4CDM) in Tanzania in 2007. The project, which operates with financial support from the Dutch Government, is being implemented jointly by the Centre for Energy, Environment, Science and Technology (CEEST Foundation) and the Environment Protection and Management Services (EPMS). The CD4CDM seeks, among other things, to improve Tanzania's institutional preparedness for hosting CDM projects, including enabling the Designated National Authority to efficiently approve CDM projects in line with the country's sustainable development priorities. The project also aims to build the capacity of local experts in key sectors in the identification, design and implementation of CDM projects. The capacity of relevant institutions in appraising, funding, and promoting the CDM and carbon offset investments is also targeted. Finally, the project supports mechanisms to promote Tanzania as a CDM investment destination.

2.1.2 United Nations Convention to Combat Desertification (UNCCD)

For Tanzania, efforts to combat desertification and land degradation are part and parcel of the national efforts to address poverty and ensure sustainable development. The relevance of these issues to bioenergy is that they will ensure the protection of land upon which bioenergy crops can be planted. Tanzania boosted its efforts to ensure sustainable land management and to combat desertification after the Rio Conference in 1992. Some major milestones include: the 1994 National Environment Action Plan (NEAP), designed to undertake analyses at the national level and to provide a framework for incorporating environmental considerations in government decision-making processes; the 1997 National Environmental Policy (NEP), formulated to define national goals and strategic objectives in the environmental sector; the 1999 National Action Programme (NAP) to combat desertification; and the 2002 Institutional Framework for Environmental Management (ILFEMP) in Tanzania.

The National Strategy for Growth and Reduction of Poverty (NSGRP) of 2005 highlights the close relationship between poverty reduction and the sustainability of the productive sectors, particularly agriculture. This sector accounts for 45 percent of the Gross Domestic Product and about 60 percent of the export earnings, as well as providing a livelihood for over 80 percent of the population. The NSGRP also views energy as critical for the attainment of the Strategy and Millennium Development Goals.

In order to address challenges of land degradation and desertification, Tanzania enacted the National Environmental Management Act (EMA) in 2004 as a framework environmental law to ensure coherent environmental management which includes sustainable land management principles. More importantly in March 2006, the government adopted a National Strategy for Sustainable Land Management and Protection of Water Catchments Areas. This is a comprehensive five-year programme, intending to address twelve identified challenges. The Strategy promotes renewable energy as well as alternative sources of energy, particularly in the dryland areas, as a way of addressing the chronic problem of deforestation for energy needs.

2.1.3 Convention on Biological Diversity

Before the ratification of the CBD, most Tanzanian laws on natural resources were termed 'resource exploitation statutes' because they did not address the conservation or sustainable management of natural resources. Also underlying most of Tanzania's secondary legislation was the notion that natural resources are a source of revenue and exploitation rather than as a source of sustainable income; this is evidenced by the focus of by-laws on revenue collection.¹⁷⁶

In order to fulfil its obligations under the CBD, Tanzania enacted its first environmental policy in 1997. Among other things, the policy aims at sustainable, secure and equitable use of resources for meeting the basic needs of the present and future generations, without degrading the environment or risking health or safety. With this policy in place, the Vice President's Office launched the Institutional and Legal Framework for Environmental Management Project (ILFEMP) in 1998. The overall objectives were to establish an analytical basis for a future framework for environmental management and to draft a framework Environmental Management Bill which gave birth to the present Environmental Management Act (EMA) of 2004.

In essence, the EMA follows closely the CBD, covering issues such as *in-situ* and *ex-situ*, conservation, and mandates environmental impact assessments. It also enshrines the precautionary principle and the polluter pays principle, among others. The Forest Policy (1998) and the Forest Act (2002) were promulgated to introduce principles of sustainable utilization of forest resources in furtherance of the CBD commitments. All these policies and

¹⁷⁶ Options for an institutional framework for environmental management. Final Report Vol. 1. 2003. Vice-President's Office, Division for the Environment.

legal instruments are naturally relevant for the sustainable use of Tanzania's resources for bioenergy purposes. The Second National Report on the Implementation of the Convention on Biological Diversity provides greater detail for activities and projects implemented by the government to meet its international obligations.¹⁷⁷

3. NATIONAL POLICIES RELEVANT TO BIOENERGY

At present, there is no specific policy on biofuels. This section examines national policies that are nevertheless relevant to bioenergy in Tanzania. Primarily, these include Tanzania's policies on energy, agriculture, forestry, trade, land, environment, employment, science and technology, and investment promotion. In this respect, special consideration should be given to the fact that in Tanzania, biofuels production is either from plants (crops) or wood. All these policies are relevant for bioenergy in Tanzania because it is believed that biofuels production could have various effects such as boosting employment, science and technology as well as tax revenues.

3.1 National Energy Policy (2003)

The first energy policy for Tanzania was formulated in April 1992. Since then, the energy sector has undergone a number of changes, necessitating adjustments to this initial policy. These changes include changes in the role of the government from a service provider to a facilitator, liberalization of the market and encouragement of private sector investment. The overall objective of the National Energy Policy of 2003 is to contribute to the development process by establishing efficient energy production, procurement, transportation, distribution and end-user systems in an environmentally sound manner and with due regard to gender issues.

The Energy Policy takes into consideration the need to enhance the development and utilization of indigenous and renewable energy sources and technologies. It mentions renewable energies in general but does not specifically discuss biofuels. It identifies the need to establish norms, codes of practice, guidelines and standards for renewable energy technologies and the need to facilitate the creation of an enabling environment for the sustainable development of renewable energy sources in Tanzania. The

¹⁷⁷ Second National Report on the implementation of the Convention on Biological Diversity. 2004.

current renewable technologies in use in Tanzania include improved wood-fuel stoves and charcoal production practices, biogas, windmills, and solar thermal and photovoltaic (PV) technologies. The renewable energy sources cited in the policy as having the most potential are micro-hydro, geothermal, wind and solar energy. The policy provides that the government would support the research and development of renewable energy technologies. However, no resources have been allocated for this purpose in the budgets for the periods from 2006–2007 and 2007–2008.

The Energy Policy recognizes the implications of certain types of energy consumption on the environment. In recognition of the effect of fossils fuels as a source of greenhouse gas emissions, pollutants and particulate matter, the policy promotes cleaner production of energy. It emphasizes the 'polluter pays' principle and the need to strengthen cooperation through national, regional and international energy programmes that seek to mitigate the environmental impacts of energy. It explicitly promotes the development of alternative energy sources to protect forests

The policy encourages public and private sector partnerships to invest in the provision of energy services. It also seeks to promote private initiatives at all levels and stresses the need to make local and foreign investors aware of the potential of the Tanzanian energy sector.

3.2 Trade Policy for a Competitive Economy and Export-led Growth (2003)

The Trade Policy for a Competitive Economy and Export-led Growth of 2003 emphasizes the need for the government to enable a business environment and utilize the private sector as the engine driving economic activities and growth. The policy intends to transform the economy from one characterized by supply constraints into a competitive, export-led system that is responsive to enhanced domestic integration and at the same time participates in the global economy as a result of national trade liberalization.

The trade policy encourages export primarily by reducing export taxes. It seeks to stimulate investment flows into export-oriented sectors in which Tanzania has a comparative advantage, and thereby encourage the introduction of technology and innovation into production systems as the basis for economic competitiveness. Further, the trade policy stresses the need to achieve and maintain a long-term current account balance and

balance of payment. Policy instruments available to facilitate import and export trade include tariffs, duty draw-back scheme and export taxes. The government uses these instruments to encourage export of value-added goods and to discourage export of unprocessed products such as cashew nuts and oilseed among others.

3.3 National Environmental Policy (1997)

The National Environmental Policy of 1997 emphasizes that environmental issues should never be treated in isolation. This is due to the fact that the lives of all Tanzanians are intimately connected to the natural environment, even more so in consideration of the fact that a majority of the population is reliant on the agricultural sector for their livelihood. Therefore the policy emphasizes the need to integrate environmental issues in all sectors of the economy and in decision-making, planning and implementation activities.

The Environmental Policy is guided by the principles of the Rio Declaration on Environment and Development. The major concepts included in the policy which have implications for biofuels include: polluter pays principle, precautionary principle, environmental impact assessment and economic instruments for protection of environment. Any biofuel production enterprise will be therefore subjected to emission control measures, environmental impact assessment, environmental audits and inventory for pollution control.

The Environmental Policy recommends the use of improved production systems through technologies and processes that utilize resources more efficiently and that at the same time generate less waste, recycle and re-use by-products. It also supports the use of clean technologies and the production of increasingly safe and non-toxic products.

3.4 Agricultural and Livestock Policy (1997)

The main objective of the Agricultural and Livestock Policy of 1997 is to ensure basic food security and to improve national standards of nutrition by increasing output, quality and availability of food commodities. The policy advocates increased agricultural productivity and area expansion. It also underscores different ways to enhance income generation and thus improve living standards in rural areas. The policy also seeks to encourage greater foreign exchange earning by stimulating production and exportation of cash

crops such as coffee and cotton. It also aims at producing and supplying raw materials including industrial crops. 'Raw material' in these cases can also be feedstock that is used for biofuel industries, and therefore has evident implications for food security. The Agriculture and Livestock Policy categorizes various crops and notes different objectives according to these classifications. The crops addressed in the policy include oil seeds, maize and sugar among others. With regard to oilseeds, the policy draws a distinction between edible and industrial oilseed (castor seed is the only industrial oilseed referred to in the policy). Again the participation of the private sector is underscored in the policy by supporting the development of these crops into a dependable source of foreign exchange earnings. As with other policies, the role of the government will be limited to facilitating private sector investment and regulating activities to the minimum extent necessary. Maize, which can be used for ethanol production, is also the main food crop in Tanzania, and therefore exportation is possible only when there is surplus production. Similarly, sugar (which is used to produce bioethanol) is a regulated crop considering its consumption for food purposes.

Concerning land utilization, the Agriculture and Livestock Policy stipulates that special areas will be created and set aside for investors. Land will be allocated to investors according to their ability to develop the land appropriately.

3.5 Employment Policy (1997)

Among the objectives of the Employment Policy of 1997 is the identification of potential sectors for employment and establishing strategies to utilize such sectors to create employment opportunities. It also seeks to make more attractive and lucrative, employment in key sectors such as agriculture. In this regard, the policy emphasizes the way in which science and technology can promote employment. In the agriculture sector, the Employment Policy encourages the investment in and improvement of basic infrastructure such as roads, water supply and electricity to augment agricultural productivity. Again, the government sees its role as providing a conducive environment for project implementation. The policy therefore provides a good ground for pushing forward the biofuel industry which could offer new employment opportunities and be in line with the stated objective of making the agriculture sector attractive in terms of employment prospects. The Employment Policy further recognizes the need to provide tax relief for the industry and trade sector and provide incentives for investors.

3.6 Forest Policy (1998)

The goals of Tanzania's Forest Policy of 1998 are to enhance the contribution of the forest sector to sustainable development in Tanzania as well as the conservation and management of the natural resources for the benefit of present and future generations. The Forest Policy mentions bioenergy as the main source of fuel in rural areas, accounting for 90 percent of the total energy consumption. It also states that the contribution of the forest sector to the national Gross Domestic Product has been underestimated because of the uncontrolled consumption of woodfuels.

The Forest Policy promotes increased employment and foreign exchange earnings through sustainable forestry-based industrial development and trade. To fulfil this, the government encourages establishment of private woodlands and plantations for wood fuel production and provides support through research, extension services and financial incentives.

3.7 Investment Policy (1996)

The 1996 Investment Policy highlights the necessary elements to create an enabling environment for investment. It calls for tax incentives, private investment guarantees, and zero taxation for the importation of capital goods. As regards the energy sector, the policy encourages investment in commercial and alternative sources of energy, emphasizing the utilization of domestic resources with the aim of ensuring security and continuity of supply, and reducing dependence on biomass fuels.

4. NATIONAL LEGISLATION RELEVANT TO BIOENERGY

The legal framework relating to biofuel production, promotion and use in Tanzania is still a work in progress. At the moment, there is no umbrella legislation specifically governing the production of biofuels from energy crops, but various laws and regulations contain provisions which may be applicable to biofuels. These laws govern different aspects which are important to biofuel production from any source, including land ownership and land use planning, food security, environmental protection, social guarantees as well as trade and investment. This section contains an overview of relevant laws and subsidiary regulations.

4.1 Petroleum Supply Act

The Petroleum Supply Act (2008) governs the importation, exportation, transportation, storage, wholesale and retail distribution of petroleum and petroleum products, and repeals the Petroleum Conservation Act of 1984 (CAP 392). Formulation of this new law was necessitated by policy changes and challenges encountered in the regulation of Tanzania's petroleum sub-sector. The relevance of this Act for bioenergy is that it contains some provisions regarding the licensing, importation, transportation, storage and distribution of biofuels, as the latter is included under the definition of petroleum products. The Act does not however, address any aspect relating to the production of biofuels.

There is no definition of biofuels in the law but the definition of petroleum products in section 3 stipulates that for the purposes of the law, the latter includes:

"organic compounds, pure or blended, which are derived from the refining or processing of petroleum crude oils, biofuels or synthetic fuels and includes biodiesel, bioethanol products and blended finished oils among others."

Section 7 requires those responsible of petroleum supply operations to obtain a licence. Section 3 defines petroleum supply operations as "all operations and activities for, or in connection with the importation, landing, loading, transformation, transportation, storage, distribution, wholesale or retail of petroleum and petroleum products." Section 13 obliges persons intending to construct petroleum installation to obtain prior approval from the Energy and Water Utilities Regulatory Authority. Part VIII makes further provisions regarding pricing of petroleum products, which includes biofuels, and other regulations on petroleum supply operations. All these tasks fall under the responsibility of the Authority.

Section 4(c) of the Act applies to standards, technical specifications and quality control norms for petroleum products and is relevant for the blending of biofuels. Section 42(1) authorizes the formulation of specifications for petroleum products and the blending of biofuel and synthetic fuels and lubricants. These standards are to be approved by the Energy Ministry following consultation with the Tanzania Bureau of Standards (TBS) and shall be published by order in the *Official Gazette*. TBS is

responsible for formulating standards and specifications for imported or locally produced goods and its activities are governed by the Tanzania Bureau of Standards Act of 1975 (Cap 130).

The Act contains provisions relating to construction approvals and operating license (as well as the procedures for license applications).¹⁷⁸ The construction of pipelines, refineries and bulk liquefied petroleum gas facilities are governed by Part IV of the Act. Significantly, the Act provides clauses on public health and safety and the environment, creating cross-linkages with the primary laws regulating these spheres which are looked at in detail below (sections 4.2 and 4.5). Part VII of the law also outlines pricing mechanisms for petroleum and petroleum products and the determination of prices in the supply chain. The Act allows for a certain degree of economic regulation by the state and contains provisions for the monitoring of consumer prices in certain situations.¹⁷⁹

The National Biofuels Task Force is currently developing guidelines on biofuels and has plans to draft a Biofuel Act. However, given that the Petroleum Supply Act brings biofuels under a distinct legislative framework and empowers the minister responsible for energy to make regulations on blending of biofuels, it can be said to provide a basis for certain (production related) activities in the sector.

4.2 Environmental legislation

Several environmental problems can be associated with the use and production of bioenergy from energy crops in particular where sustainable agricultural practices have not been followed. Land degradation, depletion of vegetation cover and biodiversity loss are some possible environmental problems that may be associated with the cultivation of crops. Tanzania has an umbrella law (the Environmental Management Act (2004)) as well as sectoral laws regulating different aspects of environmental protection (the most relevant to bioenergy are the Forest Act (2002) and the Water Utilization (Control and Regulation) Act (1974)). In the absence of laws specifically targeting biofuels production, these laws provide the primary regulatory context for bioenergy feedstock cultivation, use and promotion.

¹⁷⁸ See www.parliament.go.tz.

¹⁷⁹ Ibid.

4.2.1 Environmental Management Act

The Environmental Management Act of 2004 (CAP 131) is a comprehensive environmental law aimed at providing a coherent approach to environmental management. It advocates the right to a clean, healthy and safe environment, buttressed by provisions enabling all persons whose rights are threatened to bring actions to the courts. It enshrines various principles of international environmental law, including the precautionary principle, the polluter pays principle, the principle of ecosystem integrity and public participation in environmental planning and management. Environmental protection, which is at the core of the statute, is effected through mechanisms such as environmental restoration orders which require persons to, *inter alia*: take action to prevent the commencement or continuation of pollution and the restoration of land, including the replacement of soil, replanting of trees and other flora. Similarly, conservation orders can also be issued to preserve flora and fauna, and to prevent or restrict the scope of any agricultural activity on land which is subject to an environmental easement (section 161). The latter refers to an obligation in respect of the use of that land.

A direct nexus with energy is created through section 64, which directs the minister, in consultation with the Ministries for Forestry and Energy, to promote the use of renewable sources of energy by promoting research, creating incentives and taking measures to encourage the planting of trees and woodlots by individual users, institutions and community groups. Furthermore, the Commissioner for Energy is a member of the National Environmental Advisory Committee established under section 3(1) of the Act.

Section 81 of the Environmental Management Act (EMA) requires persons or enterprises proposing a project to conduct environmental impact assessments (EIA) for projects that may adversely affect the environment. The Third Schedule (made under section 81) of the Act lists the types of projects which require environmental impact assessments. These include major land use changes but also forestry-related activities, agriculture, processing and manufacturing industries and waste disposal. The First Schedule of the Environmental Impact Assessment and Audit Regulations (2005) provides a more specific list of the type of projects requiring an EIA. Those of relevance to bioenergy include:

- the development of large-scale renewable and non-renewable sources of energy (section 7(v));

- agricultural projects necessitating resettlement of communities (section 1(v)) ;
- large scale mono-culture (section 1(iii)); and
- other forestry-related activities such as commercial charcoal, firewood and other forest harvest operations (section 3(vii)).

In accordance with these provisions, the large-scale production and storage of biofuels will be subjected to EIA, regardless of whether they are derived from energy crops or wood.

Part IX of the EMA contains provisions regulating separately the disposal of solid, liquid and gaseous waste which necessarily affect the production of bioenergy from municipal wastes and industrial by-products. Local authorities are empowered to manage waste disposal, and to issue guidelines for the treatment and disposal of industrial liquid and gaseous waste. Part X of EMA empowers the Environment Minister to adopt regulations on environmental quality standards developed by the National Environmental Standards Committee (under the Bureau of Standards Act (1975)). Such standards can relate to soil quality, quality for discharge of effluent in water sources, air quality, control of noise and vibration, and control of noxious smells, *inter alia*. To date, the minister responsible for the environment has promulgated a set of standards for water, air and soil quality.¹⁸⁰ The discharge of effluent (defined as deriving from agricultural and industrial sources, *inter alia*) into water warrant specific standards that shall be formulated by the National Environmental Standards Committee. These include measures for the treatment of effluent before their final discharge into sewage systems, and prescribing requirements for the operator of any plant or undertaking to carry out necessary works for the treatment of effluent before it is finally discharged. The standards are also applicable to the biofuel industry in that they provide specific limits on the amount of permissible pollution and lay down specific qualitative measures to be achieved for the purpose of environment protection.

Section 80 of EMA mentions economic incentives and instruments as an option for the protection of the environment. The Directorate of Environment is empowered to prepare proposals on packages of economic instruments and financial incentives to the Minister for Environment. The

¹⁸⁰ Environmental Management Standards on Air, Soil and Water, *Government Gazette* No.s 237–239 of 2007 respectively.

latter will issue regulations following consultation with the Finance Minister. While there are thus far no regulations on such economic instruments, this provision can also be seen as an incentive for the production of biofuels. Some incentives and financial measures for protection of the environment include effluent charges, based on the content and quantity of discharges into the air, water or sewerage system (section 80(2)). Alternatively, the government can use taxation schemes to support environment protection by waiving or imposing lower taxes on environmentally friendly technologies or products; biofuel production and processing that takes into account environmental considerations could fall under such a category. The objectives behind these economic incentives are expounded upon in the Act where the minister may make rules on economic instruments, thereby prescribing (section 80(2)): how best to oblige firms to consider environmental aspects in production and investment decision-making; measures to be adopted to internalize environmental costs without relying on the pricing mechanism; price-based measures, user charges and subsidies to internalise environmental costs and benefits; subsidies, tax deductions and rebates to be paid to advance environmental protection; and special rants for particular programmes.

Similar to arrangements under the Land Act (see section 4.4), under the EMA section 42, each local government authority shall prepare an Environmental Action Plan in accordance with the National Plan. In the formulation of such plans, authorities are required to identify environmental problems prevalent in the area and recommend mitigating measures. This provides a useful safeguard for planning with respect to the cultivation of bioenergy – or indeed any other type of agricultural – crop. The minister is also empowered to make rules prescribing the preparation of periodic environmental plans at sector level. Another parallel with the Land Act can be seen in section 71, where local government authorities are required to take into account environmental land use planning directives when designating areas for industrial, commercial or agricultural purposes.

4.2.2 Water Utilization (Control and Regulation) Act

The Water Utilization (Control and Regulation) Act of 1974 as amended in 1981, may affect the production of biofuels in Tanzania in light of the fact that biofuel crops require irrigation but also considering the significant amount of water use in biofuel processing industries. It should be noted however, that much of Tanzania's agricultural production is rainfed.

Section 8 of the Act vests ownership of water with the United Republic of Tanzania. Utilization of water is regulated by way of permits, licenses and water rights. A Central Water Board is designated as the primary advisory organ in matters relating to the utilization of water, including the apportionment of national water supplies, modification of water rights, and the measures to be taken in case of drought, *inter alia*. Section 15(1) requires those using water in large quantities to make an application to be granted water rights for indefinite or definite periods. Water rights entitle the owner of such right to divert, store, and abstract water from such source or sources as may be specified in the permit. This right is not absolute and can be amended or revised when considered necessary under the statute.

Section 13 of the Act prohibits owners of land (or those who carry out forest activities) from exceeding consumption of 22 700 litres of water per day. Sections 15(a), 17, and 18(b) of the amended 1981 version of the Act includes provisions on standards for the effluent and water discharged from commercial and industrial operations. Schedules to the amended Water Utilization Act provide for effluent standards on temperature, odour, taste and suspended solids among others. These standards are complemented by standards made under the Environment Management Act (EMA). Although many of the EMA's provisions relating to protection of water resources are adequate, the government is in the initial stages of amending the Water Utilization Act because it does not adequately address conservation and sustainable utilization of water, and contains outdated abstraction and user rights principles.

4.2.3 Forest Act (2002)

In view of the significance of woodfuel energy in the overall energy matrix of the country (biomass accounts for 90 percent of energy sources), the comprehensive regulatory provisions of the Forest Act of 2002 assume importance. Although not likely to be a problem in Tanzania given its abundance of arable land that is not locked in forested areas, the provisions of this Act are also relevant to ensure that the cultivation of bioenergy feedstock does not encroach forested areas. The Act contains provisions on the utilization of forests and forest products and contains robust enforcement mechanisms and procedures. A striking feature of the law is its clear procedural guidelines for broad-based decision-making that includes all tiers of government level, particularly local and village authorities. Section 3 of the Act defines forest produce to mean anything which is produced by or

from trees or grows in a forest, or is naturally found in a forest (including *inter alia*, firewood, charcoal, peat, plants and wood oil).

The Forest Act enumerates several objectives pertaining to sustainable management and conservation of forest biodiversity (in section 3). Of particular interest for present purposes, it also aims to ensure the sustainable supply of forest products and services by maintaining sufficient forest area under effective and economical management, and also to enhance the quality and improve the marketability of forest products and regulate their export. A National Committee is established to advise the minister on aspects relating to the management of forest reserves, review of the forest policy, issuance of concessions and attached conditions, and declaration of forest reserve areas.

The Forest Act classifies forests under different categories, namely: national forest reserves, local authority forest reserves, village forests, private forest, and community forest reserves (section 4). The relevance of the Forest Act to biofuels of wood origin is that access to forest produce is influenced by the type of forest. Forest management plans are developed on the basis of these categories (section 11). The Act contains detailed descriptions of the process of formulating such plan including public consultation and participation (section 14). One required element of such plans is a description of the areas of land within the forest reserve in which local user zones are proposed to be established to facilitate local communities to access and obtain benefits from the reserve. The plans are to set out the manner and form of any user rights such local communities may have, including the practices and customs of local communities in relation to the forest which govern their use of the resources therein. The plans must also contain provisions regulating commercial exploitation of the forest resources as well as the conservation and preservation of the same. Finally, the forest plans must include the charges and fees which may be applied for access to (or use of) the forest and forest produce.

Areas designated as national forest reserves may be used for sustainable production of timber and forest products; to protect watersheds and wild plants, and conserve soil; and to protect areas of national significance, biodiversity and genetic resources. These objectives demonstrate a clear equilibrium of environmental and economic imperatives. National forest reserves can be accessed by licenses which are issued subject to conditions stipulated in the act and must comply with the management plans of the reserve (sections 49 and 51). Among the activities requiring permits in forest

reserve areas are: cutting or removing trees; removing wild plants; occupying land; clearing or cultivating; sowing or planting any crops or other vegetation; domestic commercial use; and export of forest produce (section 49(1)). The Act sets out the requirements and procedures for obtaining such permits. Conditions attached to the permits relate to the types of plant protection substances that can be used; volumes and specifications of timber to be felled; and transfer requirements among others. As well as revocation or suspension of permits for breach of rights granted under permits, where the unapproved exercise of a new right consists of "cutting down, felling, damaging, digging up or removing any tree or protected wild plant for purposes of sale, barter or profit or for use in any trade, industry, commercial or research undertaking, the Director [of Forestry] shall issue a mandatory stop order" (section 25(8)). It should be noted that domestic or personal uses are excluded from the purview of this provision.

The Act contains provisions governing applications and decision-making criteria governing concessions (section 20). Accordingly, the minister shall have regard to, *inter alia*, the uses to which the applicant is proposing to put the forest land; the duration of the proposed use; and any economic and social benefits and costs, both national and local, which might flow from the grant of a concession, including the implications for employment in such forest land. Among the types of conditions attached to the concessions are disposal of waste; pollution avoidance; payment of rent, fees, royalties and other imports; and afforestation and reforestation.

The Act has also introduced the concept of Joint Forest Management (JFM) in managing central and local forest reserves. This concept enhances community access to biomass and other forest produce. JFM is based on the authority of the national and local government to share management rights and responsibilities and share costs and benefits. In each case, negotiations are held and a JFM agreement is concluded which formalizes a contractual relationship between the relevant government institution and the local communities (Part III).

Access to firewood in villages and private forest reserves is free but depends on land tenure arrangements in place. For example, farmers are allowed to collect wood fuel for their farm or household. Access to village forest land is controlled by village regulations on the harvesting of woodfuel and other forest products. To enhance the conservation of village and private forests the Forest Act allocates powers to district authorities and village governments to enact by-laws for conserving forests (section 37) as

permitted by the Local Government (District Authorities) Act of 1982 that empowers villages to make by-laws for implementing primary legislation.

As regards private forests, rights of occupancy are granted under Part IV of the Act. Section 21 of the Forest Act allows individuals to use private forest for commercial purposes. Holders of rights of occupancy of forests may not use such resources other than for the "growing of good forestry, for the commercial production of forest produce, for water or soil conservation, or for the preservation of wild plants" (section 19). Holders of such rights may be an individual or group of persons, and the right of occupancy may be held in common, or in accordance with customary law, or in accordance with the provisions of the Land Act 1999 and the Village Land Act.

Detailed provisions are set out in the Act concerning the management of village and community forest reserves, the rights and duties of villages and communities in respect of these reserves, and the functions of management entities. Unless a joint management agreement or other arrangement specifically provides otherwise, the law provides villages and communities the right to "enter, occupy, use and harvest the produce of the forest [...], in a sustainable manner in accordance with the terms of any village land forest management plan, by-laws, rules, agreements or customary practices" (sections 41(a) and 47(a)). This is an important provision when considering that communities require firewood for heating, cooking and other energy needs. Some obligations conferred upon villages and communities include the duty not to transfer existing rights exercisable within the community.

Trade in forest produce is also governed by the Act. Restrictions on export are expounded upon in the Act that include compliance with export certificates and other quality certification measures. Internal and foreign trade may be restricted by the minister if it affects the sustainability of forests and the welfare of those obtaining a livelihood therefrom, as well as in order to conform with international agreements, *inter alia* (section 63(2)). Restrictions of tree cutting would be enforced where rights of occupancy could potentially result in interference with natural water supplies, soil erosion, loss of biodiversity, hindrance of the natural regeneration or a general deterioration of the environment (section 66(1)). The Act also contains rules in furtherance of conservation objectives of trees, wild plants and wild animals (Part VIII).

Apart from regulating access to firewood and forest products, the Forest Act also contains the requirement to conduct an environmental impact assessment (EIA) for proposed forest activities. Section 18 of the Act imposes an obligation to undertake an EIA for any development projects in national forest reserves, private forest reserves or in environmentally-sensitive forest areas, including watersheds. A non-exhaustive list of such activities is set out, which includes commercial logging and agricultural development on an area exceeding 5 hectares. Any agricultural activities which occupy more than 5 hectares are also subject to an EIA. In conducting an EIA under the Forest Act, due regard must be given to the guidelines set out by authorities and organizations responsible for the protection of the environment in Tanzania (section 18(3)).

4.3 Investment legislation

4.3.1 Tanzanian Investment Act

The Tanzanian Investment Act of 1997 governs general investment matters in Tanzania and provides favourable conditions for investors. Foreign investors or joint ventures with initial capital of US\$ 3 000 000 or its equivalent in Tanzanian shillings, and Tanzanian investors with capital of not less than US\$ 100 000 can enjoy favourable investment terms under the Investment Act.

Section 4 of the Act establishes as a "one-stop-shop" the Tanzanian Investment Centre (TIC),¹⁸¹ which coordinates the establishment of business enterprises. As provided under section 18 of the Investment Act, the TIC provides assistance with the following: incorporation of businesses; filing of VAT forms; filing of investment registration forms; facilitating the obtaining of necessary licenses, approvals, facilities or services; and filing of immigration forms.

Once an investor meets the minimum capital requirement, the project is eligible for registration with TIC and is entitled to receive a certificate of incentives. A holder of this certificate enjoys benefits such as exemption from import duties and deferment of VAT on project capital goods, favourable investment allowances and deductions on corporate tax (section 16).

¹⁸¹ www.tic.tz.org.

Sections from 20 to 23 of the Act provide other incentives, including investment guarantees, such as the transfer of capital profits, guarantees against expropriation and such additional incentives as the minister responsible for investment may prescribe. Investment in energy falls under infrastructure and development and is categorized as a priority sector. Though there is no special treatment with regard to biofuels, once the minimum capital is met, enterprises seeking to engage in bioenergy activities will benefit from the incentives created thereunder. Most of the multinational companies that are operating in Tanzania at different stages of bioenergy production are registered with the TIC.

4.4 Land use legislation

In general, questions concerning land use are important to bioenergy production for energy crops or forest products. Tanzania is endowed with considerable land resources suitable for the cultivation of energy and other crops. Government estimates place the arable land in current use at 10 percent of the available land for agricultural production.¹⁸² The following sections elucidate that existing Tanzanian legislation goes some way in trying to prevent land grabbing as well as protecting existing land uses that the allocation of land for the cultivation of bioenergy crops will be subject to certain safeguards, thereby minimising the potential for land use conflicts.

4.4.1 Land Act and Village Land Act

As discussed in section 4.2.3 above, access to firewood in Tanzania depends on land tenure. Access to firewood for household purposes in village lands is usually free. For commercial purposes, however, some wood fuel royalties have been introduced by both district councils and central government. In general, issues relating to land acquisition in Tanzania are governed by the Land Act (1999) and the Village Land Act (1999). Their foundation can be found in Tanzania's Constitution (Art. 21(1)) which guarantees the right to own property and prohibits illegal seizure of property without fair compensation.

The Land Act also regulates the allocation of land to investors. Section 4(4) of the Land Act divides land into three categories: general, reserved and village land. Village land is managed by village councils (section 8 of the

¹⁸² Biofuels development in Tanzania. Presented by H.E. Ngemera A.R. URT Ambassador to Germany at the Third German-African Energy Forum (23–25 April 2008).

Village Land Act). Reserved land is land reserved for a particular purpose such as in accordance with the Forest Act. Most protected areas falls under this category and they are managed by a particular designated authority (Land Act, section 6).

Land acquisition for the purpose of investing in bioenergy production would fall under section 20(10) of the Land Act which contains a general rule that foreigners cannot be allocated land for any other purpose except for investment in accordance with the Tanzania Investment Act of 1997. In practice, land for investment purposes is identified, gazetted and allocated to the Tanzania Investment Centre which then creates derivative rights to investors through leases and sublease arrangements (section 20(2)). Section 8(1) of the Village Land Act imposes an obligation to village councils to be governed by principles applicable to a trustee managing property on behalf of the beneficiary. Any allocation of land to a non-village member is subject to village assembly approval.

At present, there are some 14 biofuel companies in Tanzania operating in different parts of the country, as already mentioned. Given the fact that most of these companies are foreign, they are registered with the Tanzania Investment Centre. For example, one of these companies has been given permission to acquire 9 000 hectares of land in Kisarawe. As village land is administered by the local authorities, the Tanzanian Government could not allocate the requested land to the company directly. It was therefore necessary for the company to negotiate with the respective village authorities. At the time of writing, negotiations were ongoing concerning the payment of compensation to villagers whose land will be taken to let bioenergy investment takes over. The company is expected to employ approximately 1 000 people and invest some US\$ 20 million.¹⁸³

Overall, the Land Act and the Village Land Act seem to provide adequate protection to property rights. It should be noted that the original title to land is vested with the President of Tanzania, who is also empowered to acquire land for public purposes under the Land Acquisition Act (1967). The right to land in Tanzania through the right of occupancy under the Land Act can only be granted for a period not exceeding 99 years after which the title reverts back to the government (section 32). The poverty level of property

¹⁸³ For further information, see www.biopact.com.

holders, especially in rural areas, means they are often in a weaker bargaining position in the negotiations with investors.

4.4.2 Land-Use Planning Act

To administer land for competing uses, the Land Use Planning Act was enacted in 2007 to provide procedures for the preparation, administration and enforcement of land use plans. Section 6(1) establishes the multi-ministerial National Land Use Planning Commission with representatives of the ministries of lands and human settlement; agriculture and livestock; economic planning and development; environment, natural resources, fisheries, tourism and water. The Commission has the overall responsibility for land use plans in Tanzania; all villages, districts and regions are required to have land use plans, which are registered with the Commission.

Section 28(1) of the Land-Use Planning Act requires the designation of zones for cropland, rangeland, forest land, water sources, fisheries, farming, industry, factory and workshop land. The question as to whether or not to set aside land for cultivation of energy crops will depend on the decisions of a particular planning authority over a certain area. In accordance with section 18(1), village councils and district councils are designated as planning authorities. The law is therefore based on a bottom-up approach in decision-making rather than the top-down approach allowing local communities to determine how their land should be utilized. Although this approach is commended, it should be noted that experience with the former Land Planning Commission Act of 1984 shows that preparation of land use plans is quite time- and money-consuming, which may be a challenge in funding-constrained areas.

4.4.3. Land banks

The Tanzanian Investment Centre has also been developing land banks which are depositories of records detailing lands that have been identified as suitable for investment purposes. Any investor who wants land for investment can consult the TIC, who will then direct and identify the requisite land. The investor may choose from a menu of land areas that have been earmarked for this purpose. Where the land in question is classified as village land, the TIC will act as a mediator between the investor and the

village authorities in accordance with the Village Land Act.¹⁸⁴ It should be noted that the implementation of this policy is still a work in progress due to administrative and coordination problems between TIC, the Ministry of Lands and regional commissioners.

4.5 Employment Legislation

4.5.1 Occupational Health and Safety Act

The Occupational Health and Safety Act of 2003 makes provisions for the safety, health and welfare of persons working in factories and other places. It is thus of importance because it provides standards for working in bioenergy processing industries. All workplaces must be registered in accordance with the Act (and therefore meet basic standards relating to the state of machinery, etc.) and provide a minimum number of facilities for employees. For example, the law obliges employers to ensure there is a supply of clean drinking water and sanitary facilities. Furthermore, the law mandates a thorough medical check-up of employees.

The Act provides that workers employed in any factory or workplace, if exposed to any process or harmful substance shall be provided with effective protective equipment (section 62). In addition, according to section 65 of the Act,

Every person who employs persons in agricultural activities shall be under the obligation to ensure that no employee is exposed to:

- (a) hazardous machinery and equipment;
- (b) harmful animals and insects;
- (c) infectious agents, or allergens;
- (d) hazardous chemicals; or
- (e) hazardous environments while doing work as [an] agricultural worker.

¹⁸⁴ Olenasha, W. 2005.

4.5.2 Employment and Labour Relations Act

The breadth of application of the Employment and Labour Relations Act of 2004 covers some social aspects related to bioenergy production as a source of employment either in cultivation of crops or in processing industries. The purpose of the Act is to make provisions for core labour rights, to establish basic employment standards, to provide a framework for collective bargaining, and prevention and settlement of disputes, among others. The Act prohibits child and forced labour; guarantees freedom of association; establishes minimum wages according to sector; regulates working hours and administers different types of leave, such as annual leave, sick leave, and parental leave. It also governs issues of unfair termination of employment and collective bargaining among others.

4.6 Food Security Act

The Food Security Act of 1991 was enacted to establish a governmental body tasked with overseeing the strategic grain reserve and other matters related to food security in Tanzania. Its underlying objective is to establish a system to ensure a secure food supply for all Tanzanians at all times. This Act should be viewed in light of the fact that Tanzania is not currently self-sufficient in sugar and food oil production.¹⁸⁵

Section 3 of the Act establishes a Board of Trustees whose general function is to oversee and coordinate the activities of the government to procure, store and release grain for security purposes and preparedness for any crisis in the country. Section 8(1) of the Act establishes a Department of Food Security as an advisory body to the government on food security policies. Its functions include the collection, preparation and production of data on food security. Of particular relevance to biofuel feedstock production, the department monitors the country's food situation at all stages, encompassing soil preparation, planting, growing, harvesting, storing, distributing and pricing, and also provides early warning services on food security. The department is to recommend to the government, the levels of exports and imports of major cereal staple crops annually and to procure crops for the strategic grain reserve. The department is also required to ensure the availability of relevant information concerning food and agriculture generally. Another of the Board's functions is to provide guidance and support to the

¹⁸⁵ Janssen, R. 2006.

department in its effort to collect, analyse and disseminate information relating to national food security (section 5(ii))

Where any special agricultural product is subject to the provisions of this and any other act, the Food Security Act shall prevail (section 15). This is of significance in the food versus fuel debate, as this provision implies that food security will take precedence over energy security issues when it comes to the production and consumption of crops. Though the Act is not detailed with regard to specific food crops, it seems to provide adequate space for addressing any emerging issue which might affect food security in Tanzania as it empowers the minister to make regulations on any matter for the effective implementation of the Act (section 14). The Food Security Act therefore goes some way in addressing and regulating the relationship between food security and bioenergy production in Tanzania.

5. INSTITUTIONAL FRAMEWORK FOR BIOENERGY

This part examines the role of different institutions with regards to biofuel production in Tanzania. At the time of publishing, there is no umbrella legislation governing biofuels in Tanzania and thus no legal framework for defining institutional responsibilities. However, the government is in the preliminary stage of resource mobilization to start the process of drafting such legislation. In the absence of specific legal amendments however, some key existing institutions already supports the development of the biofuels industry in the country such as the National Biofuels Task Force.

The Energy Policy of Tanzania (2003) indicates that the Ministry of Energy and Minerals will supervise implementation of the energy policy. The Ministry will, *inter alia*, facilitate mobilization of resources into areas where market forces fail to ensure adequate energy services. Furthermore, the policy asserts that the roles and linkages between the Ministry of Energy and different actors, in the sector will be determined by legislation – operators will be licensed; markets and performance will be monitored; and necessary regulatory measures will be applied.

5.1 National Biofuels Task Force

The National Biofuels Task Force was established in March 2006. Its main responsibility is to provide advice and recommendations to the government for the elaboration of suitable policies and regulations on biofuels. To some

extent, the National Biofuels Task Force has been overtaken by events in the sense that there are more than 14 companies which are already in operation.¹⁸⁶ Thus, while the Task Force is in the process of creating an enabling environment for different players to operate, the biofuels industry is already developing.

Various ministries are represented in the Task Force.¹⁸⁷ These include the Ministries of Energy and Minerals (Secretary); Agriculture and Food Security; Labour, Employment and Youth Development; Finance; Vice President's Office – Division of Environment; Water and Irrigation; Lands, Housing and Settlement Development; Attorney General's Chambers; Tanzania Investment Center; Tanzania Petroleum Development Corporation; Community Finance Limited; and Tanzania Sugar Producers' Association.

The functions of the Task Force include¹⁸⁸:

- facilitating the ongoing and potential biofuel initiatives in Tanzania such as production of biodiesel from jatropha;
- reviewing the policy and regulatory framework for biofuels;
- developing guidelines for dealing with biofuels as an interim arrangement in Tanzania;
- preparing a coordinated and integrated programme for the development of biofuels in Tanzania; and
- identifying and mapping out zones and suitable areas for biofuels development in Tanzania.

Some of the outputs expected¹⁸⁹ of the Biofuels Taskforce include the Strengths, Weaknesses Opportunities and Threats (SWOT) Analysis and Prioritized Strategic Actions; draft guidelines for biofuels development; comprehensive action plans for the development of biofuels; a preliminary review of relevant policies and legislation; and a project document on "Strengthening the policy, legal, regulatory and institutional framework to support the development of a sustainable biofuels industry in Tanzania."

¹⁸⁶ MEM, 2008.

¹⁸⁷ Ngemera, A.R. 2008.

¹⁸⁸ Ibid.

¹⁸⁹ Ibid.

Key elements of the Biofuels Development Action Plan include reviewing existing policies, and legal regulatory and institutional frameworks and standards (as well as amending or revising policies or as appropriate); finalizing the draft biofuels guideline; drafting a Biofuels Act; capacity-building for government departments and institutions to coordinate biofuels activities and projects; identifying appropriate land for biofuels production; raising public awareness so that the public can benefit from biofuels business including an information, education and communication strategy customized to the needs of different target groups; conducting study tours abroad for the biofuels task force members; and soliciting funds to implement the National Biofuel Programme.

5.2 Energy and Water Utilities Regulatory Authority

The Energy and Water Utilities Regulatory Authority (EWURA) was established under section 4 of the above-mentioned Energy and Water Utilities Authority Act of 2001. It is mandated to regulate dealings in petroleum, electricity and water in Tanzania.

The Petroleum Supply Act designates EWURA with powers to consider and issue licenses for performing petroleum supply operations. These are defined as "all operations and activities for, or in connection with, the importation, landing, loading, transformation, transportation, storage, distribution, wholesale or retail trade of petroleum and petroleum products", where petroleum products include, among others, dealings in biofuels. Section 8(1) of the Act stipulates that individuals must apply for an operational license to EWURA for a permit for one or more activities in the supply chain. This essentially means that instead of creating another institution to deal with bioenergy, the law has empowered EWURA with additional powers to deal with licensing of biofuels – the advantages being maximized use of available resources and harmonized implementation of the different sectors.

5.3 National Environmental Management Council (NEMC)

The National Environmental Management Council (NEMC) was established under section 16 of the above-mentioned Environmental Management Act of 2004. The NEMC is a government agency entrusted with the role of enforcing, reviewing and monitoring environmental impact assessment (EIA) studies. These studies must comply with the requirements contained in the EMA. Some projects requiring EIA which are relevant for bioenergy

can be found in the first schedule of Environmental Impact Assessment and Audit Regulations of 2005. These include: agricultural projects necessitating resettlement of communities; transportation of petroleum products; and the development of large-scale renewable sources of energy.

Sections 27(1) and (2) of the Petroleum Supply Act would oblige EWURA to coordinate with the competent environmental authorities to establish a classification for petroleum supply operations or projects which are to be subjected to an environmental impact assessment as a condition for issuing approval or licence.

5.4 Tanzania Bureau of Standards (TBS)

Sections 26(1) and (2) of the Petroleum Supply Act require EWURA to consult with the Tanzanian Bureau of Standards when developing a programme of gradual adoption of international standards, technical specifications and codes of practice in order to upgrade supply chain infrastructure, quality of petroleum products and services provided.

In essence, the Petroleum Act thus provides a mechanism for inter-institutional cooperation and advocates consultation and cooperation with other institutions like NEMC and TBS. The wording of the two sections imposing the obligation to consult uses the word "shall" which implies that it is mandatory for EWURA to carry out consultations, which promotes synergy and harmonization among the institutions.

5.5 Research and Development

Research and Development (R&D) in the energy sector is characterized by a lack of institutional co-ordination in respect of various on-going research activities. Most companies have R&D departments limited to their needs and some NGOs are also active in this area. The University of Dar es Salaam conducts applied research, process development and provides expert professional services to industry, government and other organizations. With regard to biofuels, it is intending to carry out research on biodiesel production from vegetable oil, and also conduct engine tests on pure biodiesel and blended biodiesel.

6. CONCLUSIONS

This study has been undertaken with the objective of analyzing how the current legal and policy framework supports the promotion, production and use of bioenergy in Tanzania and ensures its sustainability. The current attention placed on Tanzania's bioenergy sector by national authorities focuses on the need to develop an enabling environment for the industry, with a particular emphasis on biofuel from jatropha. As yet, biofuels are not at the forefront of the legislative and policy agendas, although this is quickly changing through the activities of the Biofuels Taskforce.

The Petroleum Supply Act does not address biofuels production but concentrates on trading aspects of biofuels. This gap is significant in light of the fact that Tanzania's potential for bioenergy is its natural resources and large tracts of fertile land suitable for agricultural cultivation. It follows that it is at the production stage where regulatory measures are required which will balance the country's economic and social needs with environmental sustainability. It is likely, however, that this will be included within the remit of the draft biofuels act in preparation by the Biofuels Taskforce.

Despite this existing gap, an overview of other relevant laws goes some way in providing basic environmental, social and investment guarantees, particularly at the stage most crucial to bioenergy development in Tanzania – the feedstock cultivation phase. In view of the fact that woodfuel is the main source of energy for both rural and urban communities in Tanzania, legislation affecting this activity such as the Forest Act does provide a comprehensive regulatory framework governing access to and protection of forest resources. Similar protection mechanisms can be found in the Environmental Management Act (EMA) that incorporates many of the principles of international environmental law, and like the Forest Act, mandates the use of environmental impact assessments as a precondition to the granting of permits for natural resource use. The EMA also governs quality standards for air pollution, water and soil thus offering a good mechanism for pollution control in Tanzania. The EMA further foresees the possibility of using economic instruments, such as pricing, tax relief and subsidies, for advancing environmental objectives. While no economic instruments are currently in place, these incentives made possible by the EMA could promote the sustainable production of biofuels. In addition, under the existing legal framework, areas rich in biodiversity either receive total or partial protection under the law. Areas rich in biodiversity are

declared protected areas where human activities such as crop cultivation are prohibited. These provisions are therefore in line with EC Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources, which requires a guarantee that biofuels exported to the European Union, do not originate from land with a high biodiversity value.

The Food Security Act of 1991 provides a basis for addressing issues related to food security in Tanzania. This Act also provides that food security issues will take precedence over other issues, including energy security. The Land Use Planning Act addresses the allocation of land resources for competing uses and seeks to protect village lands from arbitrary allocation to investors. Resource constraints may create difficulties in implementing this law however, as village and regional councils authorized to contract on behalf of the village community may lack time or resources to effectively carry out their role and in all events have limited bargaining power with investors. The Employment Act and the Occupational Health and Safety Act house relevant standards associated with employment and labour that are applicable, by virtue of their general nature, both in the bioenergy production and processing spheres.

In view of the fact that, at the time of writing, Tanzania does not have any specific biofuels law, institutional coordination becomes paramount to ensure that the existing regulatory environment is effectively interpreted and implemented in an integrated fashion. The composition of the National Biofuels Task Force, created in 2006 provides a diverse representation of bioenergy industry stakeholders. This Task Force could carry out a coordinating role among existing institutions in the promotion of all aspects of the bioenergy sector as an interim approach until new legislation on bioenergy is passed.

With the exception of the Energy and Trade Policies, however, many of the other policies reviewed in this chapter are at least ten years old. They may thus contain priorities that are out of date, and ostensibly were not drafted with bioenergy in mind. While the government is still in the process of developing the policy and legal framework for bioenergy, the biofuels industry is taking off. The Tanzania Investment Center has registered biofuels companies which are now at different stages of operation. It is therefore crucial that the country's existing legislation is buttressed by coordinated enforcement of existing legislation, and that priority is given to creating a robust regulatory framework for biofuels, with economic

incentives for these companies to operate and flourish, but also with rules and parameters which consider environmental imperatives.

Social benefits created by employment opportunities in the bioenergy should similarly be prioritized. Tanzania's economy is dependent on agriculture – it is a source of employment for almost 80 percent of the population. Bioenergy feedstock cultivation provides an opportunity for diversification of trade in agricultural products. It is quite often larger agricultural producers that benefit from Tanzania's exporting potential in agricultural products even though most of the country's agricultural producers are small-holder farmers. Therefore, part of the focus of new legislation should be to enhance access to micro-financing and related financial and other support schemes for small-scale farmers. Awareness-raising and capacity building initiatives will also go a long way in creating opportunities to harness the benefits of bioenergy, while safeguarding against its risks.

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G. THAILAND

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1. INTRODUCTION

This chapter examines recent trends in bioenergy policies and laws in Thailand. It begins with a summary of the energy sector with a focus on bioenergy production, promotion and use, as well as its future prospects. Next, the national legal framework in which bioenergy is developed is explored, including references to aspects such as the Clean Development Mechanism of the Kyoto Protocol. The third section takes a closer look at Thailand's bioenergy policy framework and related legislation and is followed by observations on the regional framework for bioenergy. Conclusions and recommendations for the bioenergy sector in Thailand are put forward in the final section.

1.1 Overview of Thailand's energy sector in recent years

Thailand's demand for energy has increased significantly over recent decades. Despite efforts over the past few years to shift to alternative energy sources, the country remains dependent on imports to fuel its growing manufacturing-based economy. Thailand's expenditure on petroleum imports decreased from 15.4 percent of the gross domestic product (GDP) in 2004 to 10 percent in 2008. This situation represents the combined effects of the contracting global economy, a potential decrease in demand for Thailand's exports and a vigorous government policy to stimulate renewable energy sources. Thailand's annual growth in primary energy consumption between 1999 and 2004 was more than double the world average of 2.9 percent.¹⁹⁰ In 2007, Thailand's energy make-up was: 47 percent from oil; 33 percent from natural gas; 14 percent from coal; 2 percent was derived from hydropower while 4 percent was from other sources.

Energy use in Thailand in 2007 was primarily consumed in transportation (37 percent) and industry (36 percent), with more modest use in the residential (14.79 percent), commercial (6.64 percent) and agricultural sectors (5.57 percent). Since 2005, biodiesel and ethanol fuel development is intended to contribute to the fuel mix in the transport and agriculture sectors, with biogas feeding into electricity and processed heat generation.

Thailand announced several measures in 2008 and 2009 to mitigate the impacts of fluctuating fuel and food prices. Two economic stimulus packages worth 1 566 trillion baht (US\$ 44 billion – amounting to 12 percent of its

¹⁹⁰ World Bank. 2008.

GDP) are being implemented through tax reductions, direct transfers to the poor and public works. To enhance agricultural competitiveness, 230 billion baht (US\$ 6.5 billion) will be spent over the next three years. This investment will be targeted at improving irrigation systems, improving crop seeds, agricultural standards and productivity.

Over the past five years, the government has actively promoted energy conservation and increased the share of renewable energy consumption to 5 percent in 2007. The goal in the National Alternative Energy Development Plan adopted in March 2009 is to increase the share of renewable energy to 8 percent by 2011 and 20 percent by 2020.

1.2 Future prospects for bioenergy

Thailand has strengthened the legal and policy framework promoting bioenergy production and use, primarily in the transport sector. The government has put in place tax incentives for ethanol and biodiesel producers, as well as for the automotive sector. Mandatory B2 biodiesel production guarantees and prices have created a favourable condition for growth but ethanol faces a different set of challenges. While gasohol consumption is expected to increase with greater public acceptance of gasohol compatible vehicles, many ethanol plants have been forced to suspend operations due to surplus supply and rising input costs. Although exporting surplus ethanol is an option, production for these purposes requires case-by-case approval by the Ministry of Commerce. Thailand exported around 70 million litres of ethanol in 2008, with a total value of 225 million baht (US\$ 6.4 million).¹⁹¹

A major factor in the push to increase production of biofuels is to contribute to domestic consumption as a substitute for imported petroleum. However, there is a growing expectation that Thailand may emerge as a regional exporter of biofuels within Asia. To this end, as described in section 4, Thailand is actively engaged in developing a supportive regional framework for bioenergy. Whether or not Thailand emerges as a regional hub for renewable energy will depend on the consistency and clarity of its bioenergy strategies, as well as global commodity markets. Generally, commodity producers benefited from the higher food and fuel prices in 2007–2008.

¹⁹¹ Information provided by Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy, 2009, Bangkok.

However, following high volatility in 2008, commodity prices, especially for food and fuel, are expected to decline in 2009 in response to slowing demand as the global financial crisis deepens. This situation may hamper Thailand's efforts to manage its emerging bioenergy sector. Moreover, while biofuels represent an opportunity to add value to the agricultural sector, there are also serious concerns over the future of food security in the region.

In terms of national development objectives, the Tenth National Economic and Social Development Plan for 2007–2011 establishes the guiding concept of the "sufficiency economy" in order to build economic resilience to external shocks while ensuring growth and stability. This concept provides an overarching incentive to develop alternative energy sources to lessen dependence on petroleum imports and enhance energy security, as well as to promote energy sufficiency at the local community level.

The bioenergy sector will likely have a significant impact on Thailand's agricultural sector in the future. Thailand's competitiveness in agriculture is said to be based on cheap labour and an abundance of land resources, although the value of these strengths is debatable. The benefits of the agricultural sector are visible in terms of food self-sufficiency, poverty reduction, employment creation, and increasingly, feedstock inputs into the rapidly expanding bioenergy sector. The contribution of the agricultural sector to GDP (10 percent in 2007) and to exports (15 percent in 2007) has decreased significantly since the mid-1980s. Nevertheless, the contribution of agriculture to employment remains high, accounting for 40 percent in 2008 (World Bank 2008). Demand for energy crops has the potential to create employment and value added in this key sector of Thailand's economy. Since the turn of the century, Thailand's annual expenditure on fuel imports has been rising exponentially relative to agricultural exports. Whilst there are opportunities to adding value to agricultural production through developing energy crops, several challenges have been identified and are addressed in subsequent sections of this case study.

Finding a balance between energy security, energy efficiency and sustainable resource management to develop the biofuels sector in a sustainable manner presents several challenges (see Box 1 on biofuel trade prospects in the Mekong region). It will require technological and productivity innovation alongside sustainable use of the natural resource base. Moreover, building a viable biofuels sector requires sustained political will to ensure effective implementation of policy mandates and enforcement of regulations.

Box 1: Prospects for trade in biofuels in the Mekong region

Opportunities

To add value to agricultural production, efficiently manage waste agricultural residues

To shift dependence from petroleum to enhance energy security in the emerging Mekong economies

To benefit from the Mekong's diversity of energy crops for ethanol and biodiesel

To develop small-scale bioenergy production, create resilience to external shocks, enable local energy sufficiency, stimulate rural development and reduce input costs from petroleum and fertilizers

To benefit from low costs of production (land, labour, water)

To create a potentially high demand as transportation infrastructure expands in a dynamic region

To put the Clean Development Mechanism in operation, gain carbon credits and stimulate investment and technological innovation in second generation biofuels

To develop the potential to export surplus biofuel production

Challenges

Well-defined bioenergy policies and targets at the national and regional level

Address food security concerns by balancing competing claims for land between food, fuel and fibre

Economic incentives to deliver sufficient feedstocks; enhance awareness and information on the biofuels market

Balance large-scale commercialized agro-industrial development of biofuels for the transport sector and for export

Address land use changes and labour migration within the region resulting from biofuels development; need to ensure transparent, equitable investment and safeguard land rights

Enforce strategic impact assessments to address social and environmental consequences of biofuels plans and projects

Guide private sector investment through enforcing socio-environmental regulations (air, water, land and labour laws)

Facilitate exports and secure market access (to meet sustainability criteria and address other non tariff barriers to biofuels trade)

2. LEGAL FRAMEWORK RELEVANT TO BIOENERGY

2.1 Institutional set-up of the energy sector

The energy sector in Thailand is administered by the Ministry of Energy, which was established in 2002 pursuant to the Restructuring of Government Organization Act (2002). The National Energy Policy Council, established under the National Energy Policy Council Act (1992), is responsible for managing the energy sector in Thailand, including granting energy operating licenses and issuing energy pricing regulations. Council members include ministers from all related sectors, including from defence, energy, finance, foreign affairs, agriculture, transport, commerce, science and technology, industry and the National Economic and Social Development Board. The government agencies under the Council are the Energy Conservation Promotion Fund Committee (ECPFC), Energy Policy Committee (EPC) and National Energy Policy Office (NEPO).

The National Energy Policy Council administers the Energy Conservation Promotion Fund (ECON Fund) to support renewable energy research. This fund was established under the Energy Conservation Promotion Act (1992). The main objective of this fund is to provide financial support to designated factories and buildings involved in energy conservation programmes, including renewable energy projects. The Energy Conservation Promotion Act defines renewable energy to include energy obtained from sources such as wood, firewood, paddy husk, bagasse, biomass, hydropower, solar power, geothermal power, wind power, waves and tides.

2.2 Energy laws

The legal framework governing the energy sector is underpinned by the Energy Industry Act of 10 December 2007. The objectives of this Act include promoting an adequate and secure supply of energy and promoting the use of renewable energy that has less adverse impacts on the environment. The fundamental policy guidelines under the Act mandate the procurement of energy to adequately meet demand, with good quality as well as reasonable and fair prices. The guidelines also emphasize full exploitation and development of renewable energy and indigenous energy resources for the social, economic and environmental sustainable development of the country and to reduce dependency on imported energy. It also advocates the participation of local communities and the general public in the management

and monitoring of energy-related operations. The Energy Industry Act (section 51) gives the Energy Regulatory Board the authority to issue licenses for energy industry operation and to determine the criteria, procedures and conditions for energy industry operation, including those related to: efficiency of energy and resource utilization; requirements for the use of renewable energy and environmental standards. A Power Development Fund was established in section 93 of the Energy Industry Act in order to promote the use of renewable energy and technologies in the electricity sector.

In March 2006, the Supreme Administrative Court cancelled two royal decrees that had privatized the Electricity Generating Authority of Thailand (EGAT). While this represents a significant change for the power sector, the impact on bioenergy is difficult to ascertain. The biggest discernible impact is that a flawed privatization process would have taken over the EGAT monopoly before establishing an independent regulatory authority. New attempts at privatization will likely be preceded by the establishment of a regulating authority, which should lessen the risk of EGAT's monopoly control of the transmission system.

The broad aims of Thailand's Energy Policy and Development Plan (2007-2021), approved by the Cabinet in June 2007, are to restructure energy industry management, ensure security of energy supply and promote energy conservation and efficiency. The plan prioritizes the promotion of alternative renewable energy. In the longer term, its objective is to foster competition in the energy industry. For the first time, the document incorporates controversial plans to build four nuclear power plants each of 1 000 megawatts by 2021. The Plan also addresses energy conservation measures in the transport sector. With respect to renewable and alternative energy, the Plan has the following objectives to:

- sustain the purchase of power generated from renewable energy (i.e. agricultural residues, industrial and municipal waste, biogas, wind and solar energy), including from Very Small Power Producers;
- establish a public organization to carry out the promotion of renewable energy use (currently under consideration);
- support research and development on alternative energy that is sustainable, efficient and compatible with the principle of Sufficiency Economy;
- disseminate information about alternative fuels to the public; and

- promote private sector initiatives and public participation in energy policymaking.

The government has put several measures in place to meet the targets outlined in the Energy Policy and Development Plan. A Renewable Portfolio Standard regulating new power plants that must have 5 percent of their generation capacity derived from renewable energy (i.e. solar, wind, biogas etc). The government has also put incentives in place encouraging the purchase of power generated by renewable energy, including the provision of tax credits and privileges, and subsidies in the form of 'adders' for small power producers from the Energy Conservation Promotion Fund. Further, it has also promoted special investment privileges through the Board of Investment, such as favourable tax and duty exemptions and loans, and land ownership rights for foreign investors.

In order to make progress towards greater energy efficiency, Thailand's Energy Conservation Plan (1995–2011) sets out targets for industry and transport, and equipment and appliance standards. These new targets stipulate in a Cabinet Resolution that the production of ethanol and biodiesel should reach 2.4 million litres and 3 million litres per day respectively by 2011. As of March 2009, the production of ethanol and biodiesel reached 1 million and 1.39 million litres respectively per day.¹⁹² To promote a path towards renewable energy through wind, solar, biogas and biomass, the Ministry of Energy has mandated that 5 percent of electricity generated by new conventional power plants comes from renewable sources by 2011 (through a Cabinet Resolution in 2005). The 8 percent target corresponds to a total capacity of 2 200 megawatts (MW). This means that an additional 1 340 MW needs to be installed by 2011. To meet the 1 340 MW target, the Ministry of Energy has instituted several different mechanisms, including an obligatory quota system – referred to as the Renewable Portfolio Standard.

A key to the success in generating electricity from renewable energy is the "adder" – a feed-in tariff that will provide premium rates for renewable energy and additional sums for electricity generated from renewable energy sources beyond the standard rate per unit (kilowatt hour). Current feed-in tariff levels for small power producers in 2009 are outlined in Box 2 below.

¹⁹² Information provided by Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy, 2009. Bangkok.

The Ministry of Energy is revising the feed-in tariffs to ensure economic viability of these emerging sources of renewable energy.

2.3 Environment and natural resource laws

Thailand has several key environmental laws and regulations of relevance to bioenergy in place. These include the Enhancement and Conservation of National Environmental Quality Act (1992); Factory Act (1969, amended in 1992); Public Health Act (1992); Hazardous Substances Act (1992); Forest Act (1941); Community Forest Bill (2007); Land Code (1954); and the Land Reform for Agriculture Act (1975).

The Enhancement and Conservation of Natural Environmental Quality Act establishes general environmental principles that serve as the basis for all environment-related legislation and relevant national programmes. In this way, the environmental principles in the Act are reflected in laws and regulations concerning the energy, industrial and transport sectors. It stipulates that assistance will be provided for public education with respect to statutory environmental protection requirements and regulations.

The Act sets up a National Environment Board to oversee coordination between ministries and guide conservation of national environmental quality (section 13). The law prescribes environmental quality standards and an environmental impact assessment process. It regulates aspects such as air and noise, water and other types of pollution and hazardous waste as well as the duty to use central waste treatment facilities based on the "polluter pays" principle. Interestingly, it establishes an Environmental Fund financed by the Fuel Oil Fund.

The Act contains a detailed environmental impact assessment (EIA) process, which incorporates public and expert participation in decision-making. Environmental impact assessments are used to evaluate possible environmental impacts and to establish the measures necessary to prevent, avoid, or mitigate any environmental damage that may occur during the development of large-scale projects. Large-scale CDM projects are required to conduct an EIA. The National Environment Board has mandated EIA reports be submitted to the Ministry of Natural Resources and the Environment for proposed projects if they involve: dams or reservoirs, irrigation, commercial airports, hotels, or resorts; systems under the law related to expressways and railroad-based mass transportation; mining

activities and industrial estates regulated by law; commercial ports; thermal energy-based electric power plants of 10 megawatts or higher; and large industrial operations. However, it is pursuant to the National Environmental Quality Act, that the Ministry of Natural Resources and the Environment specifically outlined industrial standards related to bioenergy, including emission standards for biomass power plants before and after 1 October 2004; industrial wastewater effluent standards for biogas plants and post-treatment systems; and general wastewater effluent standards.

Wastewater is among the main environmental concerns related to the commercialization of bioenergy. The Factory Act (1969, amended 1992) controls the establishment and operation of factories concerning: (i) location; (ii) standards on discharge of waste; (iii) documentation to ensure compliance with standards and requirements; and (iv) other health and safety requirements. The Factory Act authorizes the Minister of Industry to issue regulations to measure business facilities to treat wastewater. In accordance with the Public Health Act (1992), the Pollution Control Department is involved in a wide range of waste disposal matters, from overseeing the process of waste transportation and disposal to establishing criteria aimed at controlling public health. The Pollution Control Department and the Office of Natural Resources and Environmental Policy and Planning oversee activities that may endanger public health, as well as regulate wastewater discharge and air emissions. The Hazardous Substances Act (1992) covers chemicals or other materials capable of endangering human health and safety, livestock, plants, property or the environment. The Ministry of Industry has the statutory power to classify hazardous substances. The Act also covers control, management and disposal of waste, pollution or other substances from production plants. Wastewater and air pollution treatment are established in accordance with notifications of the Ministry of Industry on water discharge and air quality emissions.

Several forest policies impact proposed expansion of energy crop plantations in Thailand. The forest policies are based on the following national plans and acts:

- The Forest Act (1941), established by Cabinet Resolution on 3 December 1985, includes the basic principles for the long-term exploitation forests to benefit the state, with measures providing for environmental protection and promoting reforestation;

- The National Forestry Policy (1985) establishes targets for economic forests and protected forests. The target of maintaining 40 percent forested land was further divided into 25 percent for economic forests and 15 percent for conservation forests. Following the national ban on logging established in 1989, these targets were reversed to 25 percent for conservation forests and 15 percent for economic forests;
- The Tenth National Economic and Social Development Plan (2007–2011) ensures forests are maintained at no less than 33 percent, with no less than 18 percent for protected forests; and
- The Community Forest Bill (2007), adopted by the National Legislative Assembly on 21 November 2007, grants legal rights to forest communities to preserve and manage their surrounding forest lands.

The Land Code (1954) and Land Reform for Agriculture Act (1975) are the main laws regulating land in Thailand. The Ministry of the Interior is responsible for land regulations. Under the Land Code, foreign individuals and companies are prohibited from owning land in Thailand. Companies incorporated in Thailand, which are more than 50 percent Thai-owned are eligible to acquire land rights. There are however, exceptions with respect to the Board of Investment and Industrial Estate Authority of Thailand projects. Under those projects, special privileges are outlined. Foreigners may also be granted land rights pursuant to the Investment Promotion Act 1977, whereby "a promoted person shall be permitted to own land required for the promoted business in such acreage as the Board may prescribe, even though it exceeds the limit prescribed under other laws" (section 27).

2.4 Investment laws

The investment legal framework also affects the development of bioenergy in Thailand. By way of the Investment Promotion Act (1977), and its subsequent amendments, Thailand's Board of Investment (BOI) under the Ministry of Industry assists in the formulation and implementation of investment promotion policies. The BOI determines foreign ownership for investment projects on a case-by-case basis. The BOI promotes projects based on the following types of incentives: (i) right to employ foreigners; (ii) right to own land; (iii) exemption or reduction of import duties on imported machinery; (iv) exemption from income tax for a period of between 3 to 8 years; and (v) exemption from paying income tax on

dividends. A one-stop-shop is provided by the Board of Investment to help investors with administrative procedures and to obtain the necessary permits, licenses and approvals. Alternative and renewable energy was added to the list of industries targeted by BOI for a proactive marketing campaign, which indicates the increasing importance of this sector.

The Industrial Estate Authority of Thailand Act (1979) establishes an Industrial Estate Authority as a state enterprise under the Ministry of Industry. This agency is tasked with developing Thailand's industrial development policy. It administers the 34 industrial estates and 17 export processing zones in Thailand. There are two categories of industrial estates established under the Act: General Industrial Zones – areas designated for industrial activities; and Export Processing Zones – areas designated for industrial or other activities either supporting exporting businesses or exporting directly. The law is relevant from the prospective of biofuels conversion from feedstock or related industries.

The Industrial Estate Authority is responsible for issuing permits to industrial operators and granting special incentives and privileges, including the right to own land in the industrial estate area, to obtain work permits for foreign technicians and experts, and to remit foreign currency abroad. Industrial operators in Export Processing Zones are eligible for additional tax-based incentive and privileges, including:

- exemption from special fees under the Investment Promotion Act, import duties, value added tax, and excise tax on machinery, equipment, including raw materials or any other items used in the manufacture of goods which are imported into the Export Processing Zone;
- exemption from export duties, value added tax, and excise tax on products and by-products derived from the production if they are exported; and
- exemption from or refund of taxes, if goods are taken into another export processing zone as if they have been exported¹⁹³.

The Foreign Business Act (1999) restricts foreign investment in 43 business sectors, including agriculture and forestry. In early 2007, the Ministry of

¹⁹³ BOI. 2008.

Commerce proposed amendments to the Foreign Business Act to increase restrictions on foreign investments, but these have yet to be approved.

2.5 International obligations

Thailand became a party to the General Agreement on Tariffs and Trade (GATT) in 1982 and a member of the World Trade Organization (WTO) in 1995. It is also a member of multilateral environmental agreements relevant to bioenergy: the United Nations Framework Convention on Climate Change (UNFCCC) which was ratified by a Cabinet Resolution on 28 December 1994 and entered into force on 28 March 1995; the Kyoto Protocol (ratified on 28 August 2002); and the Convention on Biological Diversity (ratified on 31 October 2003).

Agricultural trade liberalisation is a critical component of the Doha Round of Negotiations in the WTO. First, commodity-exporting developing countries in particular would benefit from greater market access for agricultural products (energy crops). Second, as a major agricultural exporter, Thailand would gain from agricultural trade liberalization efforts towards the removal of export subsidies in key developed countries, such as Japan, the EU and the US. As noted in a long-standing Brazilian proposal to the WTO,¹⁹⁴ agricultural export subsidies in developed countries distort market access for trade in ethanol. Notwithstanding price support schemes for example for sugar, rice, cassava and palm oil, Thailand's agricultural sector is considered to be competitive on the world market in these agroenergy crops.

Thailand submitted an Initial National Communication on 13 November 2000 containing: its greenhouse gas inventory as of 1994; greenhouse gas projections and identification of mitigation option; existing assessments on vulnerability and adaptation; and policies, measures and other aspects related to financial resources, technology transfer and capacity building.¹⁹⁵

On 15 August 2006, the Cabinet approved the creation of a National Commission on Climate Change Policy to be chaired by the Prime Minister and be placed under the authority of the Office of Environmental Policy and Planning of the Ministry of Natural Resources and Environment. The coordinating role of such a body will invariably impact the legislative and policy framework for bioenergy. Climate change has slowly emerged as a

¹⁹⁴ Brazil. 1998.

¹⁹⁵ MOSTE. 2000.

driver for the development of bioenergy policies in Thailand. However, the introduction of a five-year National Strategy on Climate Change in early 2008 paved the way for Thailand's active engagement in this area, particularly through the Clean Development Mechanism (CDM) of the Kyoto Protocol.

The Climate Change Coordinating Unit within the Ministry of Natural Resources and Environment is responsible for providing collaboration and support to prevent and mitigate climate change impacts. Thailand is giving top priority to the implementation of CDM projects in the energy sector, including projects for the use of bioenergy, such as ethanol and biodiesel, biogas from farm and industrial wastewater and energy conversion from industrial waste.¹⁹⁶

2.5.1 Clean Development Mechanism

Following Thailand's ratification of the Kyoto Protocol in 2002, the government has implemented policies to promote energy conservation at national level, including through the allocation of US\$ 10 million in the current National Economic and Social Development Plan to increase environmental awareness and energy conservation in the primary school curriculum.

Thailand is an active host for CDM projects. The newly created Thailand Greenhouse Gas Management Organization (TGO) acts as the Designated National Authority and has adopted national guidelines for approving CDM projects. As of April 2009, the TGO has approved 60 CDM projects in Thailand.¹⁹⁷ Previously, CDM projects received their final approval on a case-by-case basis from the Cabinet, which proved to be a lengthy process taking up to 60–70 days. The TGO provides a one-stop-shop for CDM applicants. It also compiles greenhouse gas (GHG) inventories, information on GHG mitigation and promotes investment to reduce GHG emissions in coordination with the private and public sectors. The TGO is responsible for developing Thailand's CDM strategy, including comprehensive rules, regulations, national criteria and procedures for CDM projects.

The use of alternative energy is an economic indicator for Thailand's Sustainable Development Criteria for CDM project evaluation. A point

¹⁹⁶ ONEP. 2006.

¹⁹⁷ Thailand Greenhouse Gas Management Organization. 2009.

system or scoring method is used for evaluating each indicator or criterion. There are 24 indicators in four groups of sustainable development criteria. For the project to be considered as a CDM project and receive a letter of approval from the government, the project must have a positive score in each group of criteria and the total score must be positive (more than zero). Sustainable development criteria for CDM projects in Thailand are summarized in Box 3.

**Box 3: Sustainable development criteria
for CDM projects in Thailand**

1. Natural Resource and Environment Indicators

1.1 Environment Indicators

- Reduction of greenhouse gases emission as specified the Kyoto Protocol
- Reduction of air pollutant emission in compliance with air quality standards i.e. NO_x HC PM10 SO₂ CO O₃ VOC's Dioxin
- Noise and odour pollution (in compliance with government standards)
- BOD Loading in wastewater (in compliance with government standards)
- Waste management
- Groundwater contamination and soil pollution (in compliance with government standards)
- Reduction of hazardous waste

1.2 Natural Resource Indicators

- Water demand and efficiency of water usage
- Soil, coastal and river bank erosion
- Increase green areas under the project's initiative
- Ecosystem diversity
- Species diversity
- Use/import of GMO and/or alien species to the project site

2. Social indicators

- People's participation
(assessed by the level of participation being organized)
- Activities promoting social development, culture, and 'sufficiency economy' philosophy
- Workers health and surrounding community health

3. Development and/or technology transfer indicators

- Technological development
- Post Project Implementation Plan or Post Crediting Period Plan as outlined by the project
- Capacity building
-

4. Economic indicators**4.1 Increasing income of stakeholders**

- Increasing income of workers
- Increasing income of other stakeholders, for example, increasing income of farmers through selling raw materials to the project

4.2 Energy

- Use of alternative energy
- Energy efficiency
- Increase in using local content

Source: Thailand Greenhouse Gas Management Organization (TGO) 2009.

Information available at www.tgo.or.th

Thailand's development of criteria and approval procedures for CDM projects is divided into two phases: phase 1 focuses on the energy and industrial sector (now underway). In July 2005, Thailand's National Climate Change Committee approved draft procedures and criteria for projects in these two sectors. Phase 2 focuses on establishing procedures and criteria for other sectors.

Thailand's CDM policy priority is currently based on the energy sector, including:

- energy development (projects to use bioenergy, such as ethanol, biodiesel and biogas from farm and industrial wastewater; conversion of industrial waste into energy; or for the use of renewable energy sources, such as solar, wind and small hydro-power systems);
- energy efficiency (e.g. projects to increase efficiency of combustion and steam generation, cooling systems or energy use in buildings);
- environment (projects to convert waste into energy or biofertilizers);
- transport efficiency; and
- industrial processes (projects that lead to reduced GHGs).

There is significant potential to utilize the CDM to reduce GHG emissions in the energy sector in Thailand (Sitanon 2002). Over two-thirds of Thailand's total net GHG emissions are carbon dioxide (CO₂), mainly from the energy sector. Greenhouse gas emissions from the energy sector increased in relative and absolute terms from 1990 levels indicating opportunities for GHG mitigation. To date, approved CDM projects in Thailand have focused on second-generation biomass to liquid (BTL) and biogas to generate electricity and heat. As yet, CDM projects do not encompass afforestation and reforestation, although the Ministry of Natural Resources and the Environment is studying the feasibility of including criteria for afforestation and reforestation in CDM projects.

It should be noted that in Thailand, an environmental impact assessment is required for certain projects, including hydro (construction of dams or reservoirs), mining, power (thermal-electricity plants of over 10 megawatts), and large industrial refineries or factories (petrochemical operations). An initial environmental examination is required for projects with potentially limited environmental impacts. However, the Ministry of Energy can still request the preparation of an environmental impact assessment.

3. BIOENERGY POLICIES AND LEGAL FRAMEWORK

Thailand has a long history of research on biofuels initiated by the King's Royal projects in Chitralada Gardens in 1985. As the world's largest exporter of tapioca and rice, and second largest sugar exporter, Thailand has significant capacity to produce agricultural feedstock for biofuels. Thailand's energy intensity in relation to gross domestic product (GDP) has been rising since the early 1980s to a relatively high ratio of 1.4: 1, meaning that for each percent increase in GDP, there is a resulting increase of 1.4 percent in energy consumption. The majority of energy is consumed in the transport (37 percent) and industrial (36 percent) sectors.

Thailand's biofuels sector is comparatively more advanced than in other countries in Asia for several reasons. First, Thailand has been seeking to change its heavy dependence on imports of petroleum to stimulate its export-led growth. Over the past decade, Thailand spent approximately 10 percent of its annual GDP on oil imports. In light of the volatile world price of oil, biofuels offer a means to diversify fuel sources, thereby increasing energy security. In the 1980s, Thailand began investing in research

and development to decrease oil dependence by converting its abundant agricultural biomass into biofuels.¹⁹⁸ In addition, developing the biofuels sector provides an opportunity to add value to the agricultural sector and stimulate rural development. Based on this combination of diverse policy objectives, Thailand's Cabinet approved a strategic plan for gasohol in 2003 and one for biodiesel in 2005. It also created a National Committee on Biofuels Development and Promotion to coordinate efforts. Thailand's longer-term ambitious target, approved in March 2009, is to replace 20 percent of national energy consumption with renewable energy by 2022, compared with 8 percent in 2008. With its abundant agricultural resources, Thailand's objective is to increase its energy security by developing alternative energy, particularly biofuels. After outlining Thailand's recently adopted Alternative Energy Development Plan, the following section deals with policies for the main bioenergy sources: ethanol; biodiesel; and biogas and biomass-to-liquid (BTL).

3.1 Alternative Energy Development Plan

In February 2009, Thailand adopted the Alternative Energy Development Plan (2008–2022). This ambitious strategy gives priority to production and use of alternative energy that is renewable, 'clean', and able to provide the country with greater energy security. The Ministry of Energy has a budget of 15.6 billion baht (US\$ 450 million) to develop renewable energy over the next fifteen years. The goal of the Alternative Energy Development Plan is "to increase the share of the alternative energy mix to be 20 percent of the country's final energy demand by 2022." The Plan has the following general objectives, to: increase the contribution of alternative energy in order to replace oil imports; increase energy security; promote integrated green energy utilization in communities; enhance the development of alternative energy technology industries; and research, develop and encourage high efficiency alternative energy technologies.

Driven in large part by government incentives, Thailand's biofuel industry has experienced solid growth over the past few years. Liquid biofuels have been the most developed form of bioenergy in Thailand due to abundance of supply. Whilst most ethanol producers plan to supply the domestic market to meet the government's gasohol targets and to diversify the energy supply away from imported petroleum, there are emerging prospects for trade.

¹⁹⁸ JGSEE. 2009.

According to the Department of Alternative Energy Development and Efficiency (DEDE), in 2008 Thailand exported approximately 71 million litres of ethanol to a range of countries, including Australia, Japan, the Netherlands, the Philippines, Singapore and Taiwan. Exports are hampered, however, by the need for case-by-case approval by the Ministry of Commerce pursuant to the Cane and Sugar Act (1984).

Following a Cabinet Resolution on 17 May 2005, Gasohol 95 was expected to replace conventional unleaded gasoline (ULG) in 2008. Unleaded gasoline is sold at the pumps at a price set at 4 baht/litre lower than regular gasoline. A new Gasohol 95 with a higher proportion of ethanol mix (20 percent) called E20 was launched. There are also ambitious plans to develop palm oil for biodiesel. The National Energy Policy Council resolution of 2 April 2007, mandated that all diesel sold in Thailand shall contain at least 2 percent biodiesel (B2). The Energy Policy and Planning Office indicates that as of 1 February 2008, B2 is the standard biodiesel mix sold nationwide. Thailand also produces a large quantity of biofuel originating from biomass from the residues of the agricultural production process. In Thailand, biogas, mainly derived from livestock manure, is used in cooking fuel and electricity generation. The Energy Conservation Promotion Fund is supporting research on the feasibility of biogas generation from landfill and industrial wastewater.

The Alternative Energy Development Plan will be implemented in three phases. The short-term (2008–2011) focus will be on promoting proven technologies for alternative energy with high potential, such as biofuels and power and heat generation from biomass and biogas. The medium term (2012–2016) objectives are to focus on alternative energy technology industry and supporting the development of new prototypes of alternative energy technologies for higher cost-effectiveness; and promoting new technologies for biofuel production and development of Green City prototypes that lead to strengthened local alternative energy production. The final phase of the Plan (2017–2022) will entail the promotion of new technologies for alternative energy that are cost-effective, such as hydrogen energy, extending Green City and local energy. By this time, the Plan foresees Thailand as becoming a regional hub within the Association of South-East Asian Nations (ASEAN) for biofuel and alternative energy technologies. The Department of Alternative Energy Development and Efficiency outlines the following activities corresponding to the three phases:

Phase 1: 2008–2011

- research second generation technologies, e.g. on biodiesel and ethanol produced from seaweed, jatropha, cellulose, hydrogenation, biomass-to-liquid;
- extend oil palm cultivation areas to increase the agro-production of energy crops;
- undertake hydrogen research and development;
- accelerate the extension of E20/E85 in petrol stations and the development of the auto industry for E85;
- promote value added from biofuel by-products; and
- establish investment incentives under the Board of Investment.

Phase 2: 2012–2016

- promote second generation technologies for biofuel production, e.g. biomass-to-liquid, hydrogenation;
- develop other cost-effective energy crops;
- demonstrate hydrogen production and use;
- build public confidence in the use of biofuels; and
- develop Thailand as a biofuel hub and exporting centre.

Phase 3: 2017–2022

- promote second generation technologies for biofuel production, e.g. biomass-to-liquid, hydrogenation;
- increase yield per rai of energy crops;
- promote and extend the results of hydrogen use;
- promote the production of ethanol from cellulose;
- promote the downstream biofuel industry; and
- implement tax measures to stimulate the biofuels industry.

A National Committee on Biofuels Development and Promotion was set up by Cabinet Resolution on 8 April 2005. This committee is the focal point for matters relating to biofuel policymaking, monitoring and promotion. It is mandated to determine national policy and the management and development plans for biofuel production, promotion and use. The National Biofuels Committee inherits the duties and authority previously held by the National Ethanol Committee (established in 2001), which include the granting of licenses for the construction of ethanol plants and for the distribution of ethanol.

3.2 Ethanol

Thailand's gasohol production programme began in 1985 when the present reigning monarch, His Majesty King Bhumiphol Adulyadej, initiated a gasohol development project at Chitratlada Gardens in the wake of the first oil crisis in the 1970s. The King's projects supported research into the production of ethanol from sugarcane for energy use also to promote the concept of 'sufficiency economy'. Thailand is the world's largest exporter of tapioca (cassava) and second largest exporter of sugar: two main crops used in ethanol production. While cassava is a promising future feedstock for the ethanol industry, the current main feedstock for ethanol is a by-product of sugar production – molasses. As of May 2009, Thailand's existing capacity for ethanol production (from molasses, sugarcane, starch and cellulose) is 1 million litres per day with a projected ethanol capacity of 3.3 million litres per day.

The government vehicle fleet is mandated to use gasohol. Targets were set to distribute Gasohol 95 nation-wide and abolish unleaded gasoline by January 2007 as defined in a Cabinet Resolution on 17 May 2005. This target has been postponed indefinitely. Recent information from the Department of Alternative Energy Development and Efficiency indicates that as of April 2009, over 4 166 service stations nation-wide sell gasohol.

Other measures were put into place by the National Energy Policy Council to further the production and use of gasohol throughout Thailand. On 4 September 2006 a Council Resolution approved the liberalization of ethanol production plants and distribution of ethanol in order to accelerate the production, promotion and distribution of ethanol nation-wide. Due to this Resolution, ethanol producers no longer require a license to manufacture their product, only a permit from the Ministry of Industry pursuant to the Factory Act (1992).

A Gasohol Strategic Plan was proposed by the Ministry of Energy and adopted by Cabinet Resolution on 9 December 2003. A Joint Working Group comprising the Ministries of Energy, Industry, and Agriculture and Cooperatives was also created in order to determine measures to promote the construction of ethanol production plants and to develop plans for raw materials (feedstock) management. The Plan, approved by the National Biofuels Committee on 16 May 2007, consists of the following key elements:

- increasing ethanol production to 2.4 million litres per day by 2011 and 9 million litres per day by 2022;
- phasing-out methyl tertiary-butyl ether (MTBE) in unleaded gasoline;
- developing specifications for Gasohol 95 (91 octane gasoline mixed with 10 percent ethanol);
- ensuring that Gasohol 95 and 91 are available nation-wide;
- requiring by law that all petrol consumed will be Gasohol 95 by 2012; and
- carrying out research and development into vehicle performance as well as monitoring gasohol emissions.

Since 1979, the Ministry of Agriculture and Cooperatives has supported research to improve the processing of sugarcane to alcohol and, subsequently, to enhance the processing of cassava.¹⁹⁹ The Strategic Cassava Plan (2002–2006) focused on ensuring sufficient supply for industrial use without expanding cultivated areas. Thailand is investing in research to increase cassava yield from 23 to 50 metric tonnes per hectare by 2020, and sugarcane yield from 56 to 106 metric tonnes per hectare by 2021. The Ethanol-Biodiesel Club of Thailand estimates that there is a significant potential to increase domestic capacity of tapioca for export. Box 4 summarizes the main resolutions by the National Energy Policy and the Cabinet relating to ethanol.

Box 4: Resolutions pertaining to ethanol

Approving body and date	Summary of resolution
National Energy Policy Council (26 April 2002)	Outlines methods of promoting ethanol use as fuel.
National Energy Policy Council (12 September 2002)	Resolves that 0.036 baht per litre from gasohol sales goes into the Energy Conservation Promotion Fund.
National Energy Policy Council (28 July 2004)	Permits the licensing of factories producing and selling ethanol as fuel.
Cabinet (17 May 2005)	Targets set to distribute Gasohol 95 nationwide and employ measures to increase ethanol consumption.
National Energy Policy Council (22 December 2006)	Targets EURO 4 as emission standard by 2012.

¹⁹⁹ Pitisant, K. 2007.

Committee on Energy Policy Administration (5 February 2007)	Sets the price of Gasohol 91 to be less than unleaded gasoline 91 by 1.50 baht per litre.
National Committee on Biofuel Development and Promotion (16 May 2007)	Gasohol Strategic Plan approved to promote ethanol blending in gasoline at 10 percent and 20 percent up to 2.4 million litres a day by 2011.
Ministry of Energy (15 December 2007)	Sets the price of E20 lower than Gasohol 95 E10 by 2 baht per litre and lower than Benzene 95 by 6 baht per litre.

3.2.1 Government incentives for ethanol production and use

The price mechanism is the primary method by which the government promotes gasohol; the sale price of ethanol is set by the government. Excise tax and the municipality tax are exempted from the ethanol component of gasohol, allowing the retail price of gasohol to be lower than gasoline. Contribution rates to the Oil Fund from gasohol sales are lower than for gasoline, resulting in a lower retail price of Gasohol 95 compared with unleaded gasoline. At present, the gap is 4 baht (US\$ 0.11) per litre; the price gap between Gasohol 91 and unleaded gasoline is 3.50 baht (US\$ 1) per litre.²⁰⁰

The Cane and Sugar Act (1984) outlines a sugarcane revenue sharing system, whereby the cane planters are entitled to 70 percent and the cane millers to 30 percent of the revenue generated in the sugar industry.

3.2.2 Board of Investment's promotion of ethanol

Since 2006, the government has prioritized the promotion and production of biofuels. The Thailand Board of Investment (BOI) drew up incentives in accordance with the Investment Promotion Act (1977) to stimulate investment into the Thai ethanol industry. These incentives include:

- import duty exemptions for necessary equipment (although the equipment and technology required for gasohol production are available in Thailand, several joint-venture ethanol projects between Thai companies and foreign investors stipulate the condition that the

²⁰⁰ Energy Policy and Planning Office figures for 2009.

required machinery be imported from the investor's countries of origin. Hence the import duty benefits offered by the Board of Investment);

- eight-year corporate tax exemptions with no limitations;
- additional benefits for producers located in Zone 3 (Northeast and Southern Thailand), such as deductions for infrastructure costs and public utility costs, an additional 50 percent reduction in corporate income tax for up to ten years and further deductions for infrastructure installation and construction costs. (The zoning requirement was to encourage industrial clusters and foster development in the least developed areas);²⁰¹
- expanded land ownership rights for foreign investors beyond the provisions in the Land Code (1954);
- permission to bring in foreign experts and technicians; and
- work permits and visa facilitation.

The Board of Investment currently supports nearly 30 ethanol projects situated throughout Thailand that have a combined capacity of nearly 6 million litres per day. In 2008, there were several projects that sought promotional privileges from the Board of Investment to develop ethanol from cassava in the Northeast of Thailand. Five BOI-approved cassava-based ethanol projects, amounting to 16.5 billion baht (some of which are joint-venture projects between Thai and foreign partners) are expected to be built in Nakhon Ratchasima, Ubon Ratchathani, Kalasin and Chaiyaphum. Cassava production has expanded by 12 percent since 2005, and is predicted to continue to grow to provide ethanol feedstocks.

In December 2008, the Board of Investment approved ten large-scale projects to stimulate development (including an ethanol production project) producing 200 000 million litres per day from molasses sugarcane. Eighty percent of this amount shall be sold to domestic energy companies.

²⁰¹ WTO. 2007.

3.2.3 Automotive sector

Investment in the production of more fuel-efficient cars is increasing with the support of Thailand's Board of Investment. Thailand is integrated into the global chain of production for cars, with the majority of export growth in Europe, Australia and the Middle East, although the Association of Southeast Asian Nations' (ASEAN) region is an increasingly major market. After electronic and electrical components, the automotive industry accounted for the second highest contribution to export revenue in 2005 in Thailand; between 2002 and 2005, exports of motor vehicles and motorcycles grew by an average of 35.31 percent.²⁰² The auto industry is a key driver of Thailand's two-fold increase in investments to 644.5 billion baht in 2007 (US\$ 1.8 billion), primarily from Japan.

There is a significant possibility that Thailand can serve as the manufacturing hub for Flexible Fuel Vehicles (FFVs) in Southeast Asia. FFVs are vehicles designed to use fuel blended up to 85 percent ethanol. Several major car-manufacturing companies are expected to produce FFVs in Thailand, and some have introduced E20 car models in Thailand.

There are several initiatives by the private sector and other industry actors to raise public awareness concerning biofuels. Petroleum companies have joined the Ministry of Energy in promoting the benefits of gasohol by providing guarantees for cars using gasohol. In order to promote gasohol compatible cars, in 2007 the Ministry of Finance revised the excise tax. Since January 2008, the excise tax was reduced by 5 percent up to a ceiling rate of 50 percent for cars fuelled by ethanol blended with gasoline, at not less than 20 percent. To benefit from these rates, cars fuelled by E20 gasohol need to complete three performance requirements. First, the engine must be designed for at least 20 percent ethanol; second, a warrantee from the manufacturer for an engine fuelled by 20 percent ethanol is mandatory; and finally, the car must meet the Pollution Standard Accreditation from the Thailand Industrial Standard Institute (TISI) at not lower than TISI 2160-2546.

3.2.4 Trade-related issues

As of 2007, Thailand began to promote exports of ethanol as fuel. The government is contemplating how to revise the current regulatory framework

²⁰² WTO. 2007.

to enable greater flexibility to export ethanol. Alcohol production is strictly controlled under the Cane and Sugar Act (1984). Ethanol producers in Thailand must declare whether the ethanol they produce is for biofuel use or for liquor. The export of ethanol for liquor is allowed although export of Thai-produced ethanol for energy purposes to foreign consumers is currently prohibited. Given excess domestic supply, in 2008 approximately 71 million litres of ethanol were authorized for export to Singapore, the Philippines, Taiwan, Korea, Australia and the Netherlands. There are only five ethanol producers authorized to export in 2009 according to the Department of Alternative Energy Development and Efficiency.

Domestic agricultural producers benefit from product and non-specific support, including market price intervention, soft loans, price controls for certain inputs and subsidized electricity tariffs. The *Trade Policy Review* of Thailand undertaken in 2007 by the World Trade Organization calculated this support to be equivalent to approximately 1 percent of GDP and over 6 percent of total government expenditure.²⁰³ The sustainability of the entire chain of production of agro-fuels will affect trade and have development implications, particularly for developing countries. Compliance with the sustainability criteria of the European Union and Roundtable on Sustainable Biofuel guidelines may provide a sufficient incentive to address negative environmental impacts of ethanol. As with the evolution of eco-labelling and certification over the past two decades, sustainability criteria are deemed to be a central yet controversial aspect of trade in biofuels.

3.2.5 Summary

The following is a summary of the current status of ethanol production, promotion and use:

- The government intends to replace 10 percent of all gasoline with gasohol and increase the use of ethanol from 2.4 million litres per day by 2011 to 9 million litres per day by 2021.
- A new Gasohol 95 (E20) has recently been introduced. This E20 blend contains 20 percent ethanol as opposed to the more common E10 blend with 10 percent ethanol. Generally, automobiles do not need any engine alterations to switch from regular gasoline to gasohol as long as

²⁰³ WTO. 2007.

the ethanol content of the gasohol does not exceed 10 percent. However, car manufacturers have recently released car models with engines that tolerate a 20 percent gasohol mix.

- Gasohol 95 (E10) is priced at 1.5 baht lower per litre than unleaded gasoline (ULG), with the E20 blend being priced at 3 baht cheaper per litre.
- The number of gas stations selling gasohol nation-wide is 4 166.
- The government licensed 47 ethanol plants, with 12 ethanol plants in operation.
- The government has recognized several crucial problems facing the ethanol industry:
 - (i) need for greater coordination between different government ministries and departments involved in the ethanol industry;
 - (ii) an excess of supply leading to intermittent ethanol production suspensions; and
 - (iii) a domestic price of ethanol that is currently lower than the production cost.
- The government resolved these issues by taking the following measures:
 - (i) creating a joint committee with representatives from related ministries;
 - (ii) increasing gasohol distribution nationwide to stimulate demand; and
 - (iii) promoting ethanol production, including for export.

3.3 Biodiesel

With the mandatory use of B2 diesel nationwide as of February 2008, the biodiesel industry in Thailand is poised for rapid growth. The main feedstock for biodiesel in Thailand is palm oil, with increasing production of jatropha. Thailand's geographical position offers conducive climate and soil conditions for palm oil growth and production. Notwithstanding the steady increase of palm oil production in Thailand since 1995, the government's target to produce 3.3 million litres per day by 2012 is ambitious considering the existing figure of 1.39 million litres per day.

The Biodiesel Development and Promotion Strategy outlined in 2005 consists of the following key elements:

- increase biodiesel production to 3 million litres per day by 2012;
- substitute 5 percent of all diesel consumption with biodiesel by 2012;
- in order to ensure the nationwide distribution of B10 by 2012, adopt a two-stage policy to introduce B5 (5 percent biodiesel mix) in Bangkok and southern Thailand in 2008 and extend the availability of B5 to all regions of the country by 2011; and
- increase to 5 percent biodiesel (B5 blend) in 2012 the current 2 percent biodiesel (B2 blend) that was imposed in February 2008.

In order to meet the rising demand, the Ministry of Agriculture and Cooperatives plans to increase palm oil plantations by 400 000 hectares, primarily in the North and Northeast of Thailand. According to the National Palm Oil Development Plan (2008–2012), the objective is to increase productivity of oil palm from 19 tonnes per hectare to 22 tonnes, as well as to increase the crushing rate of crude palm oil from 17 percent to 18.5 percent by 2012. The Ministry of Agriculture has calculated that in order to facilitate expansion of palm oil production, an additional 5 million *rai* (800 000 hectares) of land is needed for palm oil cultivation. The Department of Alternative Energy Development and Efficiency indicates plans are in place to cultivate 4 million *rai* (640 000 hectares) in Thailand, with another 1 million *rai* (160 000 hectares) to be leased or subcontracted from the neighbouring countries of Cambodia, Lao People's Democratic Republic (PDR) and Myanmar. It is worth highlighting at this juncture that environmental considerations are imperative in target-setting to ensure that palm oil plantations do not come at a high environmental cost. Thailand has increasingly been subjected to criticism on account of plans to expand palm oil plantations which do not consider environmental or social sustainability.

In contrast to the situation of ethanol (where supply exceeds current demand), there was insufficient domestic production of biodiesel to meet the target of replacing all regular diesel with B2 nationwide on 1 February 2008. At the request of the Ministry of Energy, the Ministry of Commerce agreed to suspend the import prohibition on crude palm oil to permit the entry of 30 000 tonnes of crude palm oil (pursuant to a Cabinet Resolution passed on 22 January 2008). As of May 2009, there are 9 operational biodiesel plants in Thailand.

Box 5 below summarizes the main resolutions by the National Energy Policy and the Cabinet relating to biodiesel.

Box 5: Resolutions pertaining to biodiesel	
Approving body and date	Summary of resolution
Cabinet (26 November 2005)	Ministry of Agriculture shall: <ul style="list-style-type: none"> - complete the zoning of palm planting areas within 6 months; - establish the biodiesel purchasing price/litre as an incentive for producers (with the government to pay the difference between the actual price of diesel and purchasing price).
Committee on Energy Policy Administration (5 February 2007)	Sets the price of biodiesel B5 to be less than diesel by 1 baht/litre.
National Energy Policy Council (2 April 2007)	B5 biodiesel price fixed at 0.70 baht/litre lower than diesel.
National Energy Policy Council (9 April 2007)	Mandates the comprehensive usage of B2 by 1 February 2008

3.3.1 Government incentives for biodiesel production

The Ministry of Energy and the Bank for Agriculture and Agricultural Cooperatives have allocated a budget of 7 billion baht (US\$ 204 million) to provide loans for farmers to invest in palm oil production. Another 1.2 billion baht (US\$ 34 million) has been set aside by the Ministry of Energy to provide loans to commercial-scale biodiesel plants.

3.3.2 Research and development

According to the Energy Policy and Planning Office, the Ministry of Energy has undertaken research and development on various aspects of biodiesel together with other ministries. Research initiatives include the production and utilization of biodiesel from oil plants and animal fat and the design and installation of pilot community-based biodiesel plants. Furthermore, the Ministry has supported research into biodiesel production and use for

passenger pick-ups in Chiang Mai province. This demonstration project for biofuel production at community level is the first of its kind in Asia.

The Ministry has also engaged in studies to promote biodiesel in the transport sector, while the Ministry of Agriculture and Cooperatives is also undertaking research to increase palm oil productivity.

3.3.3 Community-based biodiesel production

Non-commercial biodiesel development is also promoted in local communities in Thailand. In 2006, the government launched the Community Biodiesel Production Plan with a budget of 100 million baht (US\$ 2.8 million) to promote biodiesel production and use in 72 communities in Thailand. The plan seeks to reduce local communities' expenses on energy by producing and using biodiesel from used cooking oil or other oil plants grown in the community to replace diesel use.²⁰⁴ It also promotes community self-reliance for energy supply and enhances the sense of community unity through the establishment of cooperatives for biodiesel production and distribution. This scheme is designed to create pilot or prototype communities for further dissemination of community-based biodiesel production and utilization schemes. The second phase of the plan expands the coverage to 400 communities, with an additional 155 million baht (US\$ 4.3 million) to purchase oil pressing and processing machines.

Financial support from the Ministry of Energy encourages small-scale community biodiesel production and use at the local level with the objective of enhancing community energy sufficiency. *Jatropha Curcas*, an oil-bearing, drought-resistant perennial plant, is used as the feedstock for these community biodiesel projects. Extensively used as biodiesel feedstock in India, *jatropha* grows easily on marginal lands and does not necessarily compete with food crops. The benefits of using *jatropha* are contingent on the availability of marginal land and the degree to which yield of oil content can be enhanced. Critics note that neither of these aspects can be easily met in Thailand; more work is needed to increase oil content and to identify appropriate land for *jatropha* cultivation.²⁰⁵ Although its use at the community level is being developed, *jatropha* is not yet considered to be commercially viable as a feedstock for the biodiesel industry in Thailand.

²⁰⁴ Samai, J. and Wanun, P. 2007.

²⁰⁵ Ibid.

3.3.4 Trade-related considerations

In January 2008, given the abrupt shortage of palm oil both for cooking oil and as an input for biodiesel, the Ministry of Energy requested the Ministry of Commerce to allow as an exceptional measure, increased imports of palm oil. Crude palm oil imports and exports are restricted under the Fuel Trade Act (2000). According to the latest Trade Policy Review undertaken by the World Trade Organization, Thailand has a tariff-rate quota regime for palm oil imports. Tariff quotas do not apply to imports from ASEAN countries, which may, upon legal enactment by the Ministry of Finance, supply items benefiting from preferential ASEAN Free Trade Area (AFTA) duty rates; this is the case, for example, with palm oil imports.²⁰⁶

Legislative authority for regulating imports is provided by the Export and Import Act (1979). The Act empowers the Minister of Commerce, with the approval of the Cabinet, to restrict imports for reasons of economic stability, public interest, public health, national security, peace and order, morals, or for any other reason in the national interest. Imports may be "absolutely" or "conditionally" prohibited; in the latter case (for example, those requiring non-automatic licensing), imports are allowed if specified conditions are satisfied. Palm oil is among the imports that may be prohibited under the various laws in place for health and safety reasons.

3.3.5 Summary

The following is a summary of the current status of biodiesel promotion, production and use:

- The current stocks of pure biodiesel (B100) within the country do not meet the demand created by the mandatory requirement to replace all available diesel nationwide with the B2 blend by 1 February 2008 (notwithstanding the Cabinet's decision to permit imports of 30 000 tonnes of palm oil).
- Several key Ministry of Energy Departmental Announcements between 2006 and 2008 established standards for industrial and community grade biodiesel, which were subsequently approved by Cabinet Resolution;

²⁰⁶ WTO. 2007.

- The government recognizes several problems concerning biodiesel promotion, production and use, such as:
 - (i) increase in the price of crude palm oil;
 - (ii) lack of sufficient supply of crude palm oil to meet biodiesel production targets; and
 - (iii) lack of consistency of quality in biodiesel production.
- Due to these concerns, in the context of the Energy Policy and Development Plan, Thailand is pursuing the following measures to address the problems related to biodiesel production:
 - (i) the Ministry of Energy is working with the Ministries of Commerce and Agriculture and Cooperatives to establish a mechanism, similar to the one in place for ethanol, for the procurement and management of raw materials needed for biodiesel production;
 - (ii) the Ministry of Energy is coordinating with the Bank for Agriculture and Agricultural Cooperatives to accelerate loan authorizations to farmers in order to encourage expansion of, and investment in, palm oil production; and
 - (iii) the Ministry of Energy is inspecting the quality of biodiesel to ensure consistency of production, with more stringent quality controls and quality tests to be conducted prior to registration.

3.4 Biogas, biomass-to-liquid (BTL) and bagasse

Thailand has been promoting biogas production and use for over thirty years, mainly for pollution control as opposed to energy efficiency. In Thailand, biogas is mostly derived from domestic pig manure used as fuel in cooking and for small-scale power generation. Recently, there have been initiatives to generate power from other biodegradable organic matter, including industrial wastewater and municipal solid waste. Methane from solid waste has a significant detrimental environmental impact – around 21 times that of carbon dioxide. At the forefront of innovative biogas projects are those from palm oil refineries, tapioca mill wastewater and rice husks through to innovative projects for elephant dung. The Ministry of Energy estimates that actual production of biogas for heat generation has reached 79 ktoe and 13 ktoe for electricity. There is a huge potential to expand biogas production, as well as reduce methane gas emissions contributing to climate change.

The Energy Conservation Promotion Fund described above dedicated approximately US\$ 33 million between 1995–2004 on research and development of biogas generation from wastewater treatment systems in industrial factories. The development of a National Biogas Strategy provides information to pig and dairy farms to facilitate more efficient biogas utilization. The Ministry of Energy has initiated pilot projects throughout the country to raise awareness on the use of biogas technology with support from the Energy Fund.

The biogas sector benefits from measures to increase the purchase of electricity from renewable energy producers under the Alternative Energy Development Plan (2008–2022), whereby energy from biogas is expected to triple from 224 to 600 ktoe by 2022. As mandated by Cabinet Resolution, biogas producers also benefit from the Renewable Portfolio Standard that requires 5 percent of power generated from new power plants to be generated from renewable energy. In addition, a power purchase programme was established for Small Power Producers in 1992. A budget of over 3 billion baht (US\$ 86 million) from the Energy Conservation Promotion Fund was set aside in 2001 to subsidize Small Power Producers using renewable energy. This policy raised the purchase price of electricity from small power producers to 1.96 baht/KW. Biogas benefits from a feed-in tariff of 0.3 baht per kilowatt hour. A programme for "very small renewable energy power producers" was put in place in 2002.

Pursuant to the Enhancement and Conservation of National Environmental Quality Act, factories, farms and communities are required by law to process their wastewater to a certain quality before being released into waterways. The Ministry of Natural Resources and Environment has established technical standards for wastewater. For example, the Announcement on 7 November 2005 deals with agricultural and livestock waste; the Ministry of Science and Technology Announcement on 3 January 1996 sets the standards for wastewater from factories; and another Announcement on 3 January 2004 addresses the wastewater standards for communities.

The process of electricity cogeneration from bagasse is considered to be greenhouse gas neutral, whereby the CO₂ emissions burnt in this process are equivalent to the amount of CO₂ absorbed by standing sugarcane. Research is focusing on the use of cellulosic-rich bagasse to produce ethanol. The development of biogas is also being stimulated by projects approved by the Thailand Greenhouse Gas Management Organization under the Clean

Development Mechanism of the Kyoto Protocol. CDM credits have spurred innovation in second-generation biofuels technology in Thailand. As of May 2009, Thailand has approved 74 CDM projects, including 52 for biogas and 13 for biomass operations, based on requirements for sustainable development as noted above.

While first-generation biofuel technologies focused on agricultural crops as the feedstock, second generation biomass-to-liquid (BTL) energy production is less reliant on crops and more dependent on the overall plant biomass. Biomass waste is also used as feedstock in the production process. In Thailand, several potential biomass sources have been identified by the Thailand Institute of Scientific and Technological Research (TISTR), including agricultural and wood residues, wastewater from livestock farms and municipal solid waste. It is estimated that over 600 million tonnes of agricultural and wood residues (e.g. rice husks, bagasse, palm oil residues) are available each year for conversion into heat and power. This results in a contribution of approximately one-fifth of energy consumption annually. Consequently, the potential for biomass residues contributing to power production and cogeneration is significant.

Biogas technology has increased significantly in large and small-sized livestock farms because the production of biogas helps to deal with pollution created by livestock farming. Chiang Mai University estimates that there is a significant capacity to generate biogas from wastewater produced from the approximately 5.4 million pigs in Thailand.²⁰⁷

As a country with abundant agricultural resources, Thailand is well positioned to utilize the residues generated from agro-industrial production as an energy source. Biomass power plants generate electricity from production processes or agricultural wastes such as rice husks, bagasse, corn residue, starch, palm residues and woodchips. In recent decades, agricultural producers in Thailand have gained experience in the use of farm and factory waste material to generate power. For example, saw mills burn wood chips or rice husks to create steam which is used to generate electricity via a turbine system. In April 2008, the Board of Investment approved a 1.9 billion baht (US\$ 54 million) investment by the Global Biodiesel Company to convert organic waste into energy. The private sector in Thailand is taking the lead in developing technologies to generate power from biogas from waste material.

²⁰⁷ EPPO. 2007.

Thailand is a leading sugarcane producer and the second largest global exporter of sugar. The by-products from the production process of sugar are used to produce ethanol and bagasse from the agricultural waste residues. Molasses is used to produce ethanol. Bagasse is mainly utilized in Thailand for steam and power production in domestic sugar mills, with the surplus bagasse used in cogeneration electricity production to feed into the commercial grid. There are seasonal limitations for bagasse. The Office of the Cane and Sugar Board determines the annual milling season, which varies from region to region and only lasts between 3–4 months.

Industrial factories, such as cassava processing plants, have incurred problems with wastewater disposal. The organic content in the wastewater from the production process is substantial and is required by law to be processed before being released into waterways. As a result of the substantial costs of processing wastewater, many factories manage waste cheaply by leaving it unprocessed in open tanks. The majority of the existing 77 cassava processing plants already have or are in the process of acquiring biogas technology as a more cost effective alternative to processing wastewater.²⁰⁸

4. REGIONAL ENERGY FRAMEWORK

A driving force stimulating development in the bioenergy sector in Thailand is the intensifying regional cooperation underway with its neighbours. There are several energy initiatives contained in Thailand's regional trade agreements that could be geared towards enhancing alternative energy sources, including through the promotion of South-South technology transfer for ethanol and biodiesel production and use. These frameworks are likely to stimulate trade and investment in bioenergy in Thailand. With the rapid growth of the bioenergy sector in the Asia-Pacific region, food security is on the top of the agenda linking agriculture, energy and trade cooperation.

The following regional trade agreements and initiatives are outlined below: (1) Association of Southeast Asian Nations Free Trade Area; (2) Asia-Pacific Economic Cooperation; (3) Greater Mekong Subregion; (4) Ayeyawady-Chao Phraya-Mekong Economic Cooperation Strategy; (5) Japan-Thailand Economic Partnership Agreement; and (6) Indonesia-Malaysia-Thailand Growth Triangle.

²⁰⁸ EPPO. 2007.

As outlined above, Thailand has a significant agricultural capacity to produce biofuel feedstock inputs, such as sugarcane and cassava for ethanol, and palm oil for biodiesel. A major factor in the push to increase production of bioenergy is the desire to find a substitute for imported petroleum. In contrast to Malaysia and Indonesia, Thailand has yet to develop exports of biofuels to any significant extent even though there is a growing expectation that Thailand may emerge as a regional exporter of biofuels. To this end, Thailand is actively engaged in regional cooperation in the biofuels sector.

4.1 Association of Southeast Asian Nations

The ASEAN Free Trade Area was launched in 1992 to eliminate tariffs and integrate regional economies into a single production base and regional market of 550 million people among the ten member countries. Established in 1967, ASEAN consists of Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam. An ASEAN Economic Community (AEC) is envisaged by 2015.

Bioenergy issues were addressed for the first time at the 26th ASEAN Ministers on Energy Meeting in Bangkok on 7 August 2008. With respect to expanding external energy cooperation, ministers noted the solid progress in fostering sustainable energy development in the region and agreed to deal with rising energy costs through coordinated efforts to enhance: (a) energy efficiency and conservation; (b) biofuels for transportation and other purposes; (c) energy market integration; (d) alternative and renewable energy sources; and (e) oil stockpiles. Specifically, the growing importance of biofuels was recognized as an alternative to reduce ASEAN's fossil fuel consumption. Ministers emphasized the need for closer cooperation and exchange of experience in promoting biofuel production and use, including relevant fiscal incentives, funding facilities and regulatory infrastructure.

The Ministerial Statement concludes by stating that "[g]iven the great potential of the ASEAN Member States it is envisioned that ASEAN can be the regional hub for biofuel production and trade, both intra-ASEAN and inter-region".²⁰⁹ Biofuels is also being addressed in the context of ASEAN cooperation to respond to the impacts of climate change, including a new

²⁰⁹ ASEAN-AMEM. 2008.

initiative on "ASEAN Strategy in Addressing the Impact of Climate Change on Agriculture, Fisheries and Forestry".²¹⁰

At the 14th ASEAN Summit in Cha-am, Thailand on 1 March 2009, regional leaders embraced food security as a matter of "permanent and high priority policy." In a "Statement on Food Security in the ASEAN Region," ASEAN governments agreed to prioritize food security issues and to:

- 1) adopt the ASEAN Integrated Food Security Framework and the Strategic Plan of Action on Food Security in the ASEAN Region (2009–2013) to be implemented by ASEAN Ministers on Agriculture and Forestry;
- 2) support development of agricultural productivity through greater investment, improved research and development, enhanced agricultural innovation and knowledge management, and strengthened farmers' organizations;
- 3) consider the development of biofuels through science and technology advancement that does not have adverse impacts on regional food security.

The ASEAN Integrated Food Security Framework will review the status and trends in biofuel development in the region and its potential impacts on food security. This work will be reviewed by Senior Officials Meeting of the ASEAN Ministers on Agriculture and Forestry and in the context of the *Ad Hoc* ASEAN Task Force on Task Force on Food Security established in 2008.

4.2 Asia-Pacific Economic Cooperation

The Asia-Pacific Economic Cooperation (APEC) was launched in 1989 to liberalize trade and boost investment among its 21 member countries, including Australia, Brunei Darussalam, Canada, Chile, China, Hong Kong, China, Indonesia, Japan, South Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, Philippines, Russia, Singapore, Chinese Taipei, Thailand, United States and Vietnam. Since May 2006, the Biofuels Task Force of APEC Energy Working Group has facilitated member economies to understand the potential for biofuels to replace petroleum in the transportation sector. The Working Group is in the process of establishing standards for ethanol and biodiesel. APEC has also set up demonstration

²¹⁰ Ibid.

projects to encourage second-generation biofuels.²¹¹ The objective of the APEC Energy Working Group is to maximize the contribution of the energy sector to the region's economic and social well-being through activities in energy supply and demand; energy and the environment; energy efficiency and conservation; new and renewable energy technologies; and liquid biofuel production and development.²¹²

4.3 Greater Mekong subregion

Thailand is an active participant in increasing subregional integration, with implications for the development of biofuels. The first Greater Mekong Subregion (GMS) Summit in 2002 endorsed a Strategic Framework of the GMS, focused on achieving connectivity, competitiveness and community. The GMS members are Cambodia, China (Yunnan Province and Guangxi Autonomous Region), Lao PDR, Myanmar, Thailand and Vietnam. Agriculture ministers of the six members of the GMS met for the first time in Beijing, China in April 2007 to endorse a Strategic Framework for Subregional Cooperation in Agriculture. This is part of a larger GMS integration framework initiated by the Asian Development Bank's economic corridors initiative in 1992.²¹³ With an emphasis on infrastructure development and promotion of a free flow of goods and people, the GMS has emerged as a significant regional forum for cooperation across a variety of issues, including agriculture, energy, transportation and the environment.

The Core Agricultural Support Programme endorsed by the six GMS Ministers of Agriculture in April 2007 deals with increasing trade and investment in agriculture in the GMS. It focuses on helping farmers reap the benefits of new energy crops and related technologies. The programme targets smallholder farmers and the rural poor in the GMS in order to foster cross border trade and investment in agriculture, contribute to food security and poverty reduction and promote environmental protection and sustainable use of natural resources.

Against a backdrop of high energy dependence, the agricultural sector is increasingly viewed as a source of fuel as well as food. In order to manage and share agricultural information and technology, GMS governments launched an Agriculture Information Network Service. The ADB is also

²¹¹ APEC, 2008(a).

²¹² APEC, 2008(b).

²¹³ ADB, 2008.

examining the feasibility of using biofuels in the transport sector in the Mekong region.²¹⁴

4.4 Ayeyawady-Chao Phraya Mekong Economic Cooperation Strategy

Established in November 2003, the Ayeyawady-Chao Phraya Mekong Economic Cooperation Strategy (ACMECS) includes Cambodia, Lao PDR, Myanmar, Thailand and Vietnam and "acts as a building block and moves ASEAN forward at a more even pace, on the basis of self-reliance and mutual prosperity". The objectives of this economic cooperation framework are to bridge the economic gap among the five countries and to promote prosperity on a sustainable basis. The framework seeks to build partnerships to transform the border areas of the five members into zones of economic growth and social progress, and to achieve sustainable development through South-South cooperation. The ACMECS framework has initiated over 40 common development projects as well as over 200 bilateral projects to enhance trade and investment, agriculture and industry, transport and energy linkages.

There are several bioenergy initiatives in the framework of ACMECS that have stimulated Thailand's development of biofuels. In September 2005, Thailand hosted a workshop with representatives from the five ACMECS countries to discuss the possibilities for cooperation on biofuels and to initiate a project on community-based biofuel for ACMECS members. ACMECS economies are mainly agricultural and land capacity is considered to be under-utilized. Certain agricultural areas are not conducive to farming of cash crops. Therefore, the farming of oil crops, such as jatropha represents a viable alternative source of biodiesel for local use. This would reduce farmers' expenses and dependence on oil imports and potentially lead to energy self-sufficiency in a sustainable manner. Given its advanced capacity for biofuel production, Thailand has taken the lead in technical cooperation for small-scale community biodiesel development. This assistance includes establishing learning centres in each ACMEC country to demonstrate oil and biodiesel production, financing pressing and biodiesel processing machines, as well as conducting training and information sharing on farming oil crops in local communities.²¹⁵

Thailand provides "One Way Free Trade" with Cambodia, Lao PDR, Myanmar and Vietnam, which entails the application of a 0 to 5 percent tariff

²¹⁴ Samai, J. 2009.

²¹⁵ ACMECS. 2008.

rate on nine agricultural exports from these four countries, some of which can be used in the production of bioenergy (e.g. soy beans and maize).²¹⁶ Thailand also provides technical assistance to promote market incentives for contract farming and increased agricultural productivity, which has the likely effect of expanding areas for cultivating bioenergy crops.²¹⁷ At the ACMECS Foreign Ministers' meeting in Mandalay, Myanmar in May 2007, it was agreed to expedite six key activities, including the development of jatropha plantations and biofuel production in ACMECS countries.

Within the ACMECS framework, agricultural subcontracting has increased substantially. The Thai private sector has been encouraged to invest in bioenergy in the neighbouring countries of Cambodia, Lao PDR, Myanmar and Vietnam. To this end, Thailand signed a Memorandum of Understanding with Myanmar on 2 December 2005 in which Thailand gained access to 7 million hectares of arable land for the planting of energy crops, such as sugarcane, cassava, palm oil and jatropha.

Thai private sector subcontracting of agricultural land is widely perceived to be transforming agricultural production and land use in the Mekong region. In this respect, ACMECS governments need to monitor the socio-environmental impacts of subcontracting in order to work towards sustainable development in the bioenergy sector.

4.5 Japan-Thailand Economic Partnership Agreement

In April 2007, Thailand and Japan agreed on a Japan-Thailand Economic Partnership Agreement (JTEPA) to promote cooperation in trade and investment and to create a free trade agreement between the countries. The Thailand Development Research Institute finalized a study on the potential impacts and opportunities of JTEPA for the Thai economy.²¹⁸ The results indicated the potential for Thailand to benefit from energy cooperation.

Bioenergy issues have not been explicitly addressed under the JTEPA framework. However, there is provision in Chapter 13 of JTEPA for cooperation in the field of science, technology, energy and environment, with a sub-committee established to this end. In this context, Thailand and Japan have agreed to discuss technology transfer related to bioenergy.

²¹⁶ BOI Bulletin, 2009.

²¹⁷ ACMECS, 2008.

²¹⁸ TDRI, 2006.

4.6 Indonesia-Malaysia-Thailand Growth Triangle

Energy is one of the ten major areas of cooperation in the Indonesia-Malaysia-Thailand Growth Triangle (IMT-GT). Established in 1993, the IMT-GT aims to accelerate trilateral economic cooperation in the geographical triangle that encompasses southern Thailand, northern Malaysia and Sumatra, Indonesia. The main objective of the IMT-GT Roadmap (2007–2011) is to accelerate private sector-led growth and investment to contribute to achieving the ASEAN Economic Community by 2020. Improvements in basic infrastructure will reduce transportation costs and increase the Triangle's competitiveness.²¹⁹

The Joint Ministerial Statement of the 4th IMT-GT Summit, convened on 28 February 2009 back-to-back with the 14th ASEAN Summit in Cha-am (Thailand), refers to cooperative efforts to address food security, volatility of energy prices and climate change.²²⁰

4.7 Future prospects

Increased regional cooperation has stimulated trade and investment in bioenergy in Asia, particularly in the Mekong region, but scant emphasis is placed on socio-environmental considerations. Greater attention to the social and environmental sustainability of bioenergy generation and use should therefore be paid. Providing legal clarity and consistency of implementation for trade and investment in bioenergy should also address mounting concerns about food and fuel competition for agricultural land, as well as biodiversity and forest conservation related to the expansion of agro-industrial energy crops. Policy makers need to provide a stable and predictable framework to stimulate investment in bioenergy development in the region, while ensuring environmental and social sustainability.

5. CONCLUSIONS: OPPORTUNITIES AND CHALLENGES

Bioenergy is not new to Thailand. The King's Royal Chitralada Projects initiated in the 1980s have allowed Thailand to gain considerable experience with biofuel production and use. As a leading agricultural producer, Thailand is in a favourable position to benefit from the emerging opportunities in the

²¹⁹ For more information see www.adb.org.

²²⁰ ASEAN. 2009.

bioenergy sector and diversify its energy sources. It is located in a region that is rapidly expanding trade and investment integration, with a consequent increasing demand for alternative energy sources. Thailand has already revealed itself to be a leader in 'green' energy by being the first country in ASEAN to introduce gasohol.

Thailand is supporting biofuel production and use to contribute to diversifying the fuel mix in the transport sector, including measures mandating the use of biodiesel, providing tax incentives for biofuel producers and automobile manufacturers, as well as low interest loans to palm oil producers. Thailand has commercialized gasohol and biodiesel. Gasohol already accounts for nearly 60 percent of petrol sold nationwide and biodiesel production has reached over 3 million litres. Nevertheless, a surplus in ethanol supply has caused many plants to suspend production. Conversely, while government policy guarantees the price of palm oil and mandates biodiesel use, the plan is to increase plantations, including in neighbouring countries, to maintain sufficient supply to meet the national targets. The government plans to continue to subsidize gasohol and biodiesel in addition to using the Oil Fund to support a competitive price in relation to conventional gasoline.

Whilst Thailand has signalled a new era with its renewable energy strategies, it has yet to fully assess the socio-environmental effects of biofuels. Studies illustrate that first-generation biofuels are neither environmentally efficient nor cost effective ways to reduce greenhouse gas emissions. Therefore while the increased use of bioenergy in Thailand may address immediate energy needs, it may have unintended implications for sustainable development. It may lead to increased food prices and encourage farmers to expand agriculture in environmentally fragile areas. There is thus a continuous need for Thailand to monitor and assess the implementation of its bioenergy policies and regulations. Thailand recognizes that the next decade represents a transition to more efficient and cost-effective second-generation biofuels. The government is concentrating efforts to finance research to develop necessary technologies. These efforts include collaboration with other developing countries such as Brazil to stimulate South-South bioenergy cooperation and technology transfer.

The creation of a Committee on Food Security in 2008 has enabled a coordinated national debate on how to ensure that a switch in demand for fuel does not impact negatively on agricultural production for food. Given

that Thailand is among the world's largest producers and exporters of rice, sugar and tapioca, the issue of food security takes on an international dimension. This entails that a switch from food to fuel cultivation can potentially impact upon food security in Thailand, but also affect the global food supply chain. With increasing emphasis on shifting from fossil to bio-based fuels, there will be competition for the use of land for food and energy crops, as well as a substitute for petrochemical products (plastics and fertilizers). There is a need for the government to ensure an appropriate balance between production of agricultural crops for food and fuel. Thailand would benefit from legislation ensuring the country's food security and restricting the cultivation of energy crops to marginal land.

The intention in Thailand is to develop the biofuels sector to contribute to a domestic demand stimulated by blending requirements for ethanol and biodiesel in transportation. As seen in this case study, while there is insufficient palm oil to meet the domestic demand, exports of ethanol began in 2007.

While perhaps better established in the European context, sustainability criteria for bioenergy are only now being developed in the Asian region. The development of these criteria for ethanol and biodiesel production and use in Thailand would address basic sustainability issues and deflect environmental criticism. Building a bioenergy sector based on internationally recognized sustainability criteria would also better enable Thailand to trade in biofuels in the future. As highlighted above, regional frameworks need to place greater emphasis on establishing and implementing quality standards and sustainability criteria in the bioenergy sector.

There are several observations to be made regarding the emerging national legal and policy frameworks for bioenergy in Thailand. First and foremost, Thailand is actively pursuing alternative energy sources and has emerged as a leader in biofuel development in Southeast Asia. The government is engaging with the private sector to put in place national roadmaps for ethanol, biodiesel and biogas. Such emphasis will likely assist in developing the legal and policy structure based on a deeper understanding of the impacts of various alternative energy options.

Government policies on a range of biofuels-related issues need to be closely coordinated with respect to the development of bioenergy legislation. Prime examples are links between agriculture, land use, forestry and environmental

policies to implement national targets for biofuels. Thailand needs to continue to work towards greater policy integration between different government ministries that deal with the various aspects of bioenergy policies and regulations. Recognizing the need for strengthening policy coordination between the various ministries involved in bioenergy decision-making, a new National Biofuels Organization is expected to be formed. This would buttress the role of the National Biofuels Committee that was established to coordinate and formulate national bioenergy policy in 2005.

While the Board of Investment of Thailand provides investment incentives for renewable energy, private sector interest in biofuels is also predicated on consistent implementation of targets and greater regulatory clarity and predictability. Thailand needs to regain political momentum to ensure the legal framework supports bioenergy, for example by removing trade restrictions on ethanol and biodiesel. Notably, ethanol can only be exported based on case-by-case approval from the Ministry of Commerce. The removal of trade barriers would also allow Thailand to harness the opportunities arising from the ASEAN Free Trade Area. The regional dimensions of biofuel expansion are important and require coordinated policies, for example concerning Thailand's energy crop subcontracting in the Greater Mekong Sub region.

Whilst the push for bioenergy in Thailand may have been less fuelled by environmental concerns than by visions of energy security and economic stability, this situation is changing. There is increasing recognition of the importance of environmental sustainability to underpin economic growth and prosperity. Nevertheless, environmental impact assessments are not required to be undertaken for biofuel plants or projects in Thailand. The country has also not sufficiently assessed whether the possible negative impacts of replacing petroleum with gasohol and biodiesel outweigh the benefits in terms of land use. One way to further this assessment would be to specifically address the need for an environmental impact assessment for bioenergy projects, as well as work to develop and implement biofuels sustainability standards. There is also a need to enhance enforcement of environment-related legislation in the biofuels sector. The Clean Development Mechanism of the Kyoto Protocol is stimulating renewable energy projects in Thailand. Thailand recognizes the need to establish clear and consistent requirements and approval procedures to encourage CDM investors. To this end, the approval process for CDM projects no longer

requires Cabinet endorsement. The newly created Thailand Greenhouse Gas Management Organization can approve project proposals.

The TGO has also moved quickly to establish procedures and sustainability criteria for guiding CDM projects. While Thailand is in the process of establishing the mechanisms to capitalize on CDM projects, further emphasis should be placed on strengthening the legal framework in which these projects are implemented to ensure that sustainable development criteria are met. The King's 'sufficiency economy' concept serves as an underlying stimulus for Thailand's development of alternative energy sources. Royal endorsement of energy efficiency and conservation will continue to act as a powerful incentive for the general public to embrace renewable energy sources. The King has called for an increased use of biodiesel, gasohol and other alternative energy sources to reduce oil imports, which cost the country over 10 percent of its GDP annually. Royal endorsement is sufficient to ensure that the issue remains at the top of the government's agenda.

Three observations are worth highlighting in conclusion. First, demand for bioenergy in Thailand, as in most countries, is driven by domestic regulatory mandates, with production costs subsidized by the government. To support these goals and targets for bioenergy, Thailand needs to develop implementing legislation for the acts and plans discussed in this study. Secondly, Thailand will continue to develop its agricultural sector for food, fibre and fuel in close cooperation with its Asian and Mekong neighbours. The expansion of biofuels production and use raises environmental and social concerns that have yet to be factored into the equation including diversion of land use away from food and giving up biodiversity-rich areas in favour of energy crops. Finally, there are two tracks for biofuel development in Thailand signalled by the recently finalised standards for commercial and community use. The potential is to increase energy sufficiency and resilience at the community-level, while adding value and reducing inputs to agricultural production for commercialised biofuels. However, the difficulty is to distinguish between the two in the regulatory system.

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PART III

COMPARATIVE ANALYSIS OF THE CASE STUDIES

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1. INTRODUCTION

This chapter reviews and compares the findings of each of the seven case studies. It should be noted at the outset that each of the case studies has placed emphasis on different features of national legal and policy frameworks on bioenergy, depending on the information available and the priorities of the government as well as the author's perceptions of the relative importance of a particular area. This precludes a "true" comparative approach, but still allows bringing together various elements of the case studies organized under the following key issues relevant for assessing national legal frameworks for bioenergy:

- economic and market-based mechanisms;
- environmental guarantees;
- social guarantees;
- institutional framework and public participation; and
- links with international trade and carbon financing.

Not all case studies will be addressed with regard to each of the above-outlined themes, but rather attention will be focused on countries that either present specific challenges or include innovative legal options. The chapter will conclude by presenting a menu of legal and other options that can be a source of inspiration for legal drafters and policy-makers in setting up or reviewing national frameworks on bioenergy.

2. ECONOMIC AND MARKET-BASED INSTRUMENTS

The countries under review in this study are all taking steps to harness the potential benefits of biofuels in reducing their dependence on fossil fuels and generating income by exporting biofuels to supply burgeoning regional and international markets. Different economic and market-based mechanisms have been highlighted in the laws and policies under review to promote the production and use of biofuels. Options related to targets, mandatory blending requirements and fiscal mechanisms are discussed in turn below.

2.1 Targets and mandatory blending requirements

The rationale behind targets for the production and use of renewable sources and mandatory national blending requirements is the creation of a domestic market for biofuels which provides a degree of certainty for investors and ensures the persistence of demand for consumption and use of these fuels. Compulsory blending requirements seem to be an effective regulatory instrument to promote the creation of a domestic biofuels market as biofuels are not yet competitive with fossil fuels in many nations. In addition to simply creating demand, blending requirements also provide stability to an industry that can be radically affected not only by the fluctuation of oil prices but by international prices of feedstocks, such as sugar or corn. Blending requirements also reduce the quantity of fossil fuels used, resulting in diminished air pollution and reduced emission of carbon dioxide into the atmosphere.

Overall, targets and blending requirements are likely to be most successful if the figures are progressive; flexible enough to respond to changing or unforeseen economic, social or environmental circumstances; and in conformity with installed (and carefully calculated projections of future) production capacity to prevent bottlenecks in the supply. They should be set through a multi-sector, transparent and possibly participatory process, with a view to limiting discretion of national authorities, thereby building trust and understanding among relevant stakeholders and security for investors.

ARGENTINA: A target to achieve an 8 percent share of renewable energy in the national energy matrix by 2018 has been adopted. The Biofuels Law (2006) establishes a 5 percent of bioethanol or biodiesel blending target for gasoline and diesel oil, respectively, starting 1 January 2010. A price formula was adopted in 2008 to demonstrate how bioethanol prices would be calculated in the market following the introduction of the mandatory blending requirements in 2010.

The Biofuels Law empowers the Secretary of Energy to alter these blending percentages, increasing them in times of domestic market growth or decreasing them where there are shortages. Estimates indicate that an annual production of 625 000 tonnes of biodiesel and 160 000 tonnes of bioethanol will be necessary to satisfy the 2010 blending target. The law goes on to declare that blending facilities that sell gasoline and diesel will have to purchase fuel from biofuel plants that are beneficiaries of fiscal incentives, at

prices defined by the Secretary of Energy. Thus blending facilities can only source from other plants when these specific beneficiaries are exhausted.

While flexibility is a beneficial feature of the law, the author of the case study cautions against the excessive discretion granted to the government to change the blending percentage requirements, which may lead to uncertainty for investors and industry operators.

BRAZIL: Separate legislation covers blending requirements for bioethanol and for biodiesel. Law No. 8.723 (1993) on vehicle emission pollutants had set the figure at 22 percent bioethanol blend with an option for the Executive to raise this to a 20–25 percentage. This power was already exercised in 2007 through Ministry of Agriculture *Portaria* No. 143, thus setting the existing blend figure at 25 percent. Biodiesel targets have been set more recently; Law No. 11.097 of 2005 called for a medium-term target of 2 percent biodiesel blend by 2008 with a 2013 target of a 5 percent biodiesel blend. However, given the success of the National Programme for the Production and Use of Biodiesel in augmenting production, this 5 percent target was instead moved up to 2010. In addition, the PNPB boosted the interim blending mandate to 4 percent in July 2009.

MEXICO: The Law for the Promotion and Development of Bioenergy is characteristic in the absence of mandatory targets and blending requirements to promote the creation of a domestic market for bioenergy. Economic incentives such as tax reductions can however be found in other laws (see section 3.2.1 below). Notwithstanding, the law directs the Mexican Energy Ministry to determine when biofuels will be blended with conventional fuels, although the law does note that this will be a voluntary programme and not legally binding.

On the other hand, the Climate Change Strategy of 25 May 2007 sets a target of generating 16 000 GWh annually from renewable energy sources except for large hydropower projects by 2014.

THAILAND: A National Alternative Energy Development Plan was adopted in 2009 with the goal of increasing the share of renewable energy to 8 percent by 2011 and 20 percent by 2020. At present, however, renewable energy accounts for only 16 percent (14 percent coal and 2 percent hydroenergy) of the national energy consumption. With a view to increasing the use of renewable energy, the Thai Ministry of Energy has put forward

various mechanisms, including an obligatory quota system that makes mandatory the use of renewable energy in power plants as part of the Renewable Energy Portfolio Standard.

In addition, the Gasohol Strategy, that was adopted by Cabinet Resolution of 9 December 2003, consisted of two phases: 2002–2006 and 2007–2012. During the ongoing second phase, the objective is to increase ethanol production to 3 million litres per day and make Gasohol 95 available throughout the country. Licences for 18 new ethanol plants have already been granted in addition to the eight existing ones. The Cabinet Resolution of 17 May 2005 established the objective of increasing the number of gas stations supplying gasohol from 730 to 4 000 by the end of 2005. The updated Gasohol Strategic Plan, as approved by the National Biofuels Committee on 16 May 2007, adjusts the ethanol production target to 2.4 million litres per day by 2011 and 9 million litres per day by 2022. This is in line with Thailand's earlier Energy Conservation Plan (1995–2011) which sets out targets for industry and transport, and equipment and appliance standards. A related Cabinet Resolution stipulates that the production of ethanol and biodiesel should reach 2.4 million litres and 3 million litres per day respectively by 2011. Gasohol 95 and 91 are to be made available nationwide.

In addition, a Renewable Portfolio Standard sets a target for new power plants to have 5 percent of their generation capacity derived from renewable energy (i.e. solar, wind and biogas). A National Alternative Energy Development Plan sets the target at 8 percent contribution by renewables by 2011 and 20 percent by 2020.

PHILIPPINES: The Biofuels Act (2007) imposes mandatory requirements to blend biofuels with gasoline and diesel in the transport sector. The minimum blending requirement for biodiesel is 1 percent within three months of the entry into force of the Biofuels Act (applicable from August 2007 onwards), 2 percent for biodiesel from May 2009 and 5 percent for bioethanol from May 2009. Starting in May 2011, the minimum blending requirement for bioethanol is set at 10 percent. A number of technical challenges have been identified, however, for the full implementation of these provisions. For instance, the required 1 percent biodiesel blend is still not available throughout the country. The case study also indicates that the estimations concerning biofuels production used as a basis for the Act may have been unrealistic.

2.2 Fiscal mechanisms

Of the seven countries analysed in Part II, Brazil has incorporated the most diverse range of fiscal strategies in its legal and policy framework for biofuels. The combination of the provision of federal funding for construction of plants or enlargement of installed capacity; price controls to ensure competitive bioethanol prices at the pump; tax incentives for the purchase of hybrid vehicles; and maintenance of strategic bioethanol reserves, is conducive to the development of a strong bioethanol domestic industry. For biodiesel, the Social Fuel Seal certification scheme created by Decree No. 5.297 of 2004 links tax incentives, federal credit and government-led procurement of biodiesel to the satisfaction of requirements that promote regional socio-economic development by requiring the integration of smallholders into the biodiesel production chain. Other countries have used one or other fiscal instruments. This section will first analyse tax incentives, then price-setting and finally funds, credit provision and subsidies.

2.2.1 Tax incentives

ARGENTINA: The biofuels legislation creates fiscal incentives mainly in the form of tax reductions for plants producing biofuels for the domestic market. Export taxes are also used as a means to control domestic food and fuel prices from increasing. Although export taxes in general are a controversial instrument to be used as they are perceived as a disincentive to investment, differential export taxes have also been utilised to promote an export-oriented biofuel industry. Beneficiaries of the Biofuels Law are exempt from several taxes applicable to liquid and gas. The Renewable Energy Law No. 26.190 (2007) grants the same fiscal benefits found under the Biofuels Law until 2016 to plants that generate electricity from biomass biogas or other renewable energy sources not falling within the remit of the Biofuels Law. Other tax benefits can be found in the Capital Investments Promotion Law encompassing VAT rebate for purchasing or producing capital goods, or investments in infrastructure, and reduced income tax or income tax holidays.

BRAZIL: The primary economic instrument to promote the bioenergy industry is a specific federal tax scheme for fuels enforced through Law No. 10.336 of 2001. An excise tax on the import and sale of fuel ethanol (and *inter alia*, petroleum and gas), considerably favours bioethanol. The

so-called CIDE excise tax is used to finance subsidies for the price of bioethanol, natural gas and petroleum as well as other environmental and transport infrastructure projects (Law No. 10.336, 2001 as amended, art. 1). Through Law No. 10.453 (2002), proceeds from this tax would go towards, *inter alia*, equalizing production costs of raw materials, purchasing and selling bioethanol, and financing bioethanol storage in the form of reserves. The most recent addition to this favourable tax structure is found in Decree No. 6.875 of June 2009 which lays down a tax for gasoline of the equivalent of US\$ 122 per m³ and lowers the tax for bioethanol to zero.

The tax incentive structure for biodiesel is based on a reduction of sales and social security tax rates (PIS/PASEP and COFINS), and its exclusion from the aforementioned CIDE excise tax. Law No. 11.116 (2005) sets out a complex tax framework whereby biodiesel producers may choose between a percentage of sales tax rate or a fixed tax amount per cubic metre. The law also reduced tax percentages for biodiesel import and production and empowered the Executive to alter the sales and social security tax rates if necessary. Further tax reductions are tied by the law to factors such as raw materials used in production and the status of the producer or seller and the regional origin of raw materials (art. 5). Through Decree No. 5.297 (2004) and its subsequent amendments (the latest in Decree No. 6.606, 2008) federal taxes are reduced to zero for biodiesel produced from family farmers in the less developed areas of the North, Northeast and semi-arid areas.

The purchase of flex-fuel vehicles allows buyers sales benefit from a tax differential reduction of up to 7 percent for vehicles over 2000cc; and 1 percent for those between 1000 and 2000cc (Decree No. 6.890 of 2009). The size of this differential, which was augmented as a result of the most recent spike in oil prices and economic downturn, is gradually being decreased.

ESTONIA: The Alcohol, Tobacco and Fuel Excise Duty Act (2003) in line with the EC Directive 2003/30/EC on the promotion of the use of biofuels, improves the economic attractiveness of biofuels by exempting them from the fuel excise duty. The European Directive mandated the reduction of tax rates on energy from biomass and advocated the use of tax differentiation as a promotional measure.

MEXICO: Although tax incentives are notably absent from the Law on the Promotion and Development of Bioenergy, other laws contain favourable

tax provision for the use of bioenergy. The General Law on Ecological Balance and Environment Protection of 28 January 1988 empowers the federal government and state authorities to formulate economic incentives to encourage compliance with the objectives of the environmental policy within their respective jurisdictions. Thus the law favours tax incentives for those who carry out research in technology that would lead to reduced pollution. Favourable economic, financial and tax schemes are to be granted to activities concerned with energy-saving mechanism or energy sources that reduce pollution. However, the condition attached to such tax incentives is that the activity does not produce significant negative environmental impacts. Thus under these provisions, bioenergy production activities would be prioritised to receive governmental incentives if carried out in a manner that does not produce significant negative environmental impacts.

In addition, the Income Tax Law, as modified on 1 December 2004, grants a rate of accelerated depreciation equal to 100 percent of the cost of investments made in machinery and equipment used for renewable energy (valid where the machinery and equipment depreciated at the rate of 100 percent is used at least for a five-year period).

PHILIPPINES: The tax incentives contained in the Biofuels Act to encourage the production, distribution and use of locally-produced biofuels include specific tax exemptions for the biofuel component of blended gasoline and diesel. The Act further exempts biofuels industries from wastewater charges. Other laws reviewed in the study also provide other examples of tax benefits for bioenergy activities. For example, the National Internal Revenue Code, as amended by the Expanded Value Added Tax Reform Law of 2005, exempts the sale of raw materials used in biofuel production from value added tax.

However, a more detailed tax structure is provided in the Renewable Energy Act of 2008 that grants fiscal and other benefits for the development and advancement of renewable energy resources. It stipulates that in the ten years subsequent to the coming to force of the Act, persons engaged in the plantation of crops used as biomass resources and certified by the Department of Energy, are entitled to duty free importation and shall be exempted from VAT on all types of agricultural inputs, equipment and machinery. These persons shall also benefit from tax and duty-free importation of components, parts and materials; tax credit on domestic capital components, parts and materials; tax exemption for carbon credits;

income tax breaks developers, manufacturers, fabricators and suppliers of locally-produced renewable energy equipment, components and materials; special realty tax rates on equipment and machinery, accelerated depreciation, exemption from the universal charge and zero-rated value added tax; and the 'net-operating-loss carryover scheme' through which net operating loss in the first three years of commercial activities are carried over as a deduction from gross income for the next five consecutive taxable years.

TANZANIA: Investors targeting the energy sector benefit from the Investment Act, according to which a holder of a certificate of incentives issued by the Tanzania Investment Centre enjoys benefits such as exemption from import duties and deferment of VAT on project capital goods, land rent cutbacks and deductions on corporate tax. If biofuels are to be produced for export purposes, investors in these enterprises would also benefit from export tax reductions designed to boost trade and investment flows. It is the priority of the government to encourage export of value-added goods and to discourage export of unprocessed products, which means that a more favourable tax regime will be available for the biofuel products rather than for biofuel feedstock.

Similarly to Mexican legislation, the Environmental Management Act uses taxation schemes to support environment protection by waiving or imposing lower taxes on environmentally friendly technologies or products. By this reasoning, biofuel production and processing that takes into account environmental considerations could fall under such a category.

THAILAND: A detailed tax scheme is in place regulating bioenergy activities, some included in legal and policy documents governing the sector and others found in instruments regulating related sectors such as investment. The ethanol component of gasohol is exempt from the excise tax and municipality tax, meaning that the retail price of gasohol is lower than gasoline. Also, a tax credit system has been established which encourage the purchase of power from renewable sources as well as special investment privileges administered by the Board of Investment (BOI), such as favourable tax and duty exemptions. In the latter case, the BOI promotes projects based on various types of incentives, including *inter alia*: exemption or reduction of import duties on imported machinery; exemption from income tax for a period of between 3 to 8 years; and exemption from paying income tax on dividends.

With a view to promoting cars that can run on gasohol, the excise tax was reduced by 5 percent and a ceiling rate of 50 percent was set for cars fuelled by ethanol blended with gasoline, at not less than 20 percent, beginning in January 2008. In order to benefit from these rates, cars fuelled by E20 gasohol need to complete certain performance requirements.

Furthermore, industrial operators located in Export Processing Zones (EPZ) qualify for tax-based privileges, which include exemptions from: import and export duties; value added tax; excise tax on products and byproducts derived from the production if they are exported; excise tax on machinery, equipment, including raw materials or any other items used in the manufacture of goods that are imported into the (EPZ); and a refund of taxes, if goods are taken into another export processing zone as if they have been exported.

2.2.2 Price-setting

ARGENTINA: The biofuels legislation create fiscal incentives, among which price-setting and adjustment are primary mechanisms through which domestic prices are isolated from rising international fossil fuel prices, in order to prevent inflation, preserve the national industry's competitiveness and protect consumers. Of the countries under review, Argentina has the highest degree of government intervention through this mechanism. Constant negotiations between the government and the private sector to maintain domestic price levels isolated from rising international prices have preceded the issuance of a number of resolutions by the Secretary of Energy. One example is Resolution No. 1294/2008 (on the Bioethanol Purchase Price Determination Procedure), which sets out a formula to determine bioethanol reference prices. This resolution also indicates the price to be established based on the highest price resulting from two formulas detailed in the Annex minus 3 percent. This regime is not yet operational, and the firms interested in supplying the domestic market are waiting for the application of the formula by which the price of biofuels will be set, as well as of the criteria to allocate fiscal benefits, in order to evaluate the commercial attractiveness of shifting from existing production of sugar, alcohol and soybean oil to the production of bioethanol and biodiesel for the domestic market. The case study reveals that a large amount of discretion is granted to the government in price setting for biofuels in the market. Another downside to this strategy for industry operators is that in view of the absence of a price set for biodiesel, the significant oscillation in the prices

of commodities used to manufacture biofuels (such as soybean oil) results in difficulty in developing business planning and strategies.

BRAZIL: Brazil's experience with the *Pró-Álcool* program is useful to highlight with respect to price-setting. The initial focus of the government was to ensure security of supply and assurance demand for bioethanol, using six primary mechanisms to promote production and consumption, two of which were the requirement that bioethanol be priced lower than gasoline at the pump and that a guaranteed even price would be applied across the country for all bioethanol producers. This significant government intervention was designed to be temporary, with the industry becoming highly competitive and self-sufficient only after release from governmental price controls. The National Petroleum Council was tasked with fixing the price at which bioethanol was sold.

Government control of bioethanol prices was later relinquished and the 33rd amendment to the Brazilian Constitution in 2001 completed the deregulation process in the fossil fuel sector by relaxing the state's monopoly on the oil industry, and by removing the last subsidies and price controls for gasoline, diesel oil and liquid petroleum gas (LPG). This amendment enabled the Federal Government to establish a specific tax on fuels (CIDE excise tax - *Contribuição de Intervenção do Domínio Econômico*) – which was nevertheless established to finance subsidies for the price or transport of bioethanol, natural gas and its derivatives and petroleum derivatives.

ESTONIA: The Estonia case study highlighted certain situations in the legislative framework where the government intervened in the setting of prices. The clearest example is seen in the Electricity Market Act of 2003, which contains an obligation for network operators to purchase electricity produced from renewable energy sources at a more favourable tariff of 81 Estonian crown cents per kilowatt hour. A new support scheme was implemented in May 2007 where producers have two alternatives: the sale of electricity at a fixed, favourable tariff, or the receipt of a subsidy with the option of selling the electricity at market price. Also, the Long-Term Development Plan for the Fuel and Energy Sector (2004) included key strategic objectives such as ensuring fuel and energy supply with the required quality and optimal prices.

TANZANIA: The Petroleum Supply Act sketches out different pricing mechanisms for petroleum products (which are defined to include biofuels)

and parameters for the determination of prices in the supply chain. The Act facilitates the monitoring of consumer prices in certain situations.

THAILAND: The sale price of ethanol is set by the government. Cabinet Resolution of 17 May 2005 directed the replacement of conventional unleaded gasoline by Gasohol 95 in 2008. Unleaded Gasoline is sold at the pumps at a price set at 4 baht/litre lower than regular gasoline. As contribution rates to the Oil Fund from gasohol sales are lower than for gasoline, the retail price of Gasohol 95 (with a higher proportion of ethanol mix (20 percent) called E20) is lower as compared with unleaded gasoline. At present, the gap is 4 baht (US\$ 0.11)/litre; the price gap between Gasohol 91 and unleaded gasoline is 3.50 baht (US\$ 1)/litre.

2.2.3 Funds, credit provision, subsidies and other forms of fiscal incentives

ARGENTINA: Law No. 26.190 (2007) establishing a Promotional Regime for Renewable Energy used for Electric Generation endows fiscal benefits until 2016 to power plants using renewable energy sources. It also establishes that a specific Trust Fund for Renewable Energies to be managed by the Federal Council on Electric Energy, will receive levies of up to 0.3\$/MWh collected by the Secretary of Energy to provide a subsidy of up to US\$ 1.50¹ per kilowatt/hour to those plants that are not beneficiaries under the Biofuels Law. The Fund for the Use of Renewable Sources of Energy is in turn financed by mandatory governmental contribution and was established to help attain the minimum 8 percent target in the national supply by 2012 for electricity production from renewable sources (excluding large hydro projects).

The Argentina case study draws attention to the absence in the national legislative framework of a system to provide access to credit for the construction of biofuel facilities by small- and medium-sized enterprises. This is a valid observation for most of the other countries under review.

BRAZIL: The Brazil case study states that 25 percent of the National Agency for Biofuels' concession royalties shall be allocated to fund scientific research and the development of applied technologies to prevent and compensate environmental damage caused by the oil, natural gas and biofuels industries through Law No. 9.478 on National Energy Policy, as amended by Law No. 11.921 in 2009.

¹ Equivalent to US\$ 0.004 kW/h.

The Agroenergy Plan 2006–2011 also created a consortium to guide research and development that has not yet been established due to Brazilian laws on public-private partnerships. Embrapa, a state agricultural research entity, has thus sought to form a company from which a national fund could be established that would pool public and private resources to implement the Agroenergy Plan.

In addition, ecological-economic zoning (ZEE) is tied to governmental agricultural subsidies and credits. Prior examples of tying insurance and credit schemes to climatic risk zoning by Embrapa have reportedly been successful in saving millions of dollars in avoided losses that would have resulted from growing crops in areas subject to negative climatic or hydrological conditions.

ESTONIA: In line with European legislation, Estonia's Electricity Market Act of 2003 (as amended in 2007) provides a legal foundation for support schemes whereby renewable energy electricity producers or cogeneration facilities may choose between a subsidy and a more favourable fixed tariff. Efficient cogeneration can be subsidized if waste, peat or oil shale processing retorting gas is used as source of energy production, or if the combined heat and power plant replaces existing district heating supply boiler plant with the capacity not exceeding 10 mega watts.

The subsidy rates per kilowatt hour for renewable energy sources and efficient cogeneration is 84 Estonian crown cents and 50 Estonian crown cents respectively. Both the subsidy and the purchase obligation are financed through the transmission network operator. The case study notes that the transmission operator estimates the necessary amount of subsidy at the start of each year and divides it between distribution operators proportionate to their sale volume. This amount is then reflected in the distribution service bills.

MEXICO: The Law on the Promotion and Development of Bioenergy does make provisions for promoting bioenergy projects through incentives for the manufacturing, purchase, installation, operation or maintenance of machinery for bioenergy production. In addition, the Law on Sustainable Rural Development of 2001 sets out a subsidies scheme for the agricultural sector through provisions for rural capitalization, compensation and direct payments.

In addition, the Energy Conservation Promotion Fund (ECON Fund) was established to support renewable energy research under the Energy Conservation Promotion Act (1992). The primary purpose of this fund is to provide financial support to designated factories and buildings involved in energy conservation programmes, including renewable energy projects (the bioenergy sources included in the law's definition of renewable energy include wood, firewood, paddy husk, bagasse and biomass).

Should a draft law on the use of renewable sources of energy be adopted, it would establish sources of financing for the production of energy from renewable sources. The funds envisioned by the draft law include a fund for the use of renewable sources of energy; a Green Fund; a Fund for Emerging Technologies; a fund for rural electrification; and a bioenergy fund in order to support the creation of a market for bioenergy by subsidising the difference between its cost and sale price.

PHILIPPINES In the Philippines, the Biofuels Act contains provisions on access by biofuels projects to high-priority financing from the government. The Renewable Energy Act sets up a Renewable Energy Trust Fund monitored by the National Renewable Energy Board.

TANZANIA: Aside from the pricing mechanisms to be used by the government outlined in the Petroleum Supply Act, the case study draws attention to economic instruments in the broader regulatory framework related to bioenergy, such as the Environmental Management Act, whose relevant provisions may be utilized in the context of bioenergy products and activities. The Directorate of Environment is tasked with formulating proposals on packages of economic instruments and financial incentives to the Minister for Environment with the consent of the Finance Minister. This Act provides the legal basis by which the government can use economic instruments, such as subsidies, for advancing environmental objectives in the bioenergy sector.

THAILAND: The importance of using certain fiscal incentives and funding facilities was emphasized during the 26th ASEAN Ministers on Energy Meeting in Bangkok in 2008. Accordingly, some of the incentives Thailand has put in place to encourage the purchase of power generated by renewable energy, include loans and subsidies in the form of 'adders' for small power producers from the Energy Conservation Promotion Fund. The National Energy Policy Council called for 0.036 baht/litre from gasohol sales to be

directed towards the fund. This fund allocated approximately US\$ 33 million between 1995–2004 for the research and development of biogas generation from wastewater treatment systems in industrial factories. In addition, over US\$ 86 million from the Energy Conservation Promotion Fund was set aside in 2001 to subsidize small power producers using renewable energy, as noted above. This policy raised the purchase price of electricity from small power producers to 1.96 baht/KW. Biogas benefits from a feed-in tariff of 0.3 baht per kilowatt hour. Pilot projects throughout the country to raise awareness on the use of biogas technology have been implemented with support from this fund.

The case study also notes that the Energy Industry Act sets up a Power Development Fund to promote the use of renewable energy and technologies in the electricity sector. Furthermore, the Enhancement and Conservation of Natural Environmental Quality Act establishes an Environmental Fund which is financed by the Fuel Oil Fund. The government plans to continue to subsidize gasohol and biodiesel in addition to using the Oil Fund to support a competitive price in relation to conventional gasoline. Finally, the case study mentions the allocation by the Ministry of Energy and the Bank for Agriculture and Agriculture Cooperatives of 7 000 million baht to provide soft loans to farmers to invest in palm oil production.

3. ENVIRONMENTAL GUARANTEES

One of the most difficult questions related to bioenergy, in particular biofuels, concerns the impacts of their production and use on the environment. Several case studies in this report drew attention to environmental benefits associated with bioenergy, such as diminished local air pollution and reduced carbon dioxide emissions. At the same time, international studies have raised concerns over the cost-effectiveness of biofuels in terms of climate change mitigation. Furthermore, the production of biofuels is also associated with environmental problems such as deforestation and loss of biodiversity resulting from the clearing of forested areas for agricultural purposes and the preference for large-scale monoculture.

This section will first compare how general environmental provisions contribute to ensuring the environmental sustainability of the bioenergy

sector. It will then turn to provisions related to environmental impact assessment (EIA) and to forests and biodiversity.

3.1 General environmental protection provisions

ARGENTINA: Specific environmental guarantees are not integrated into the biofuels regime in Argentina, but the Biofuels Law creates a specific institutional mandate to ensure environmental sustainability. Prior to awarding permits to biofuel production facilities, the law requires the Secretary of Energy to ensure compliance with relevant quality standards for biofuels and their sustainable production. Each facility is requested to present an environmental impact assessment including information on the treatment of effluents and waste management. In practice, however, the Secretary of Energy requires projects and facilities to present the permits awarded by provinces where facilities will be located as sufficient proof of compliance with environmental norms. Therefore, there is currently no true evaluation at national level of compliance with specific environmental standards. It should also be noted that federal jurisdiction over natural resource management is limited, so that environmental standards vary significantly across the country depending on province-level legislation.

BRAZIL: Brazilian legislation embodies several tools to ensure environmental sustainability of the bioenergy sector. It enshrines in the objectives of the National Energy Policy Law the increase of the contribution of biofuels to the national energy matrix based on economic, social and environmental considerations (art. 1). It also includes environmental considerations in relevant institutional mandates. The National Agency of Petroleum, Natural Gas and Biofuels is responsible in particular for overseeing and authorizing activities related to the production, quality control, import, export, storage, distribution, retail, marketing of national biofuels taking into account environmental conservation concerns.

Ecological-economic zoning regulations (ZEE) are land-planning instruments that can be considered another key environmental sustainability tool in Brazil's legislative framework. Established by criteria stipulated in Decree No. 4.297 (2002, as amended) to Brazil's Environmental Policy Law No. 6.938 (1981), the primary method of carrying out these zoning tools is to link them with agricultural subsidies, insurance and credit schemes. The case study notes that projections of national ZEE planning foresee an area of 25 million hectares suitable for sugarcane, specifically excluding sensitive

areas such as the Amazon rainforest and Pantanal. It is expected that future zoning criteria will take into account the need to protect primary vegetation, sensitive ecosystems, Indian Reserves and conservation areas (national and state parks). The authors of the case study note that ultimately the utility of ZEEs will be contingent upon the actual weight given to social and environmental considerations in the actual zoning exercise, as well as to compliance or monitoring mechanisms that will be put in place.

Finally, national legislation has also prohibited environmentally destructive practices related to the production of biofuels. Brazil's National Climate Change Plan called for the gradual elimination of burning to clear sugarcane fields in areas where harvesting mechanization could take place. The plan drew attention to the need to foster state and private sector cooperation where sugarcane field burning still occurred as well as the implementation of a monitoring system to enforce existing legislation that mandated that areas larger than 150 hectares that could be mechanized should use harvesting mechanization, increasing in increments of 25 percent of each agro-industrial unit every five years. To this end, Brazil's leading sugarcane production region, partnered with the National Sugarcane Industry Union to end the practice by 2014 in most areas where mechanization may take place.

ESTONIA: Since its independence from the former Soviet Union in 1991, Estonia has developed an elaborate legal framework for environmental protection and transposed into its national legal system the key environmental instruments of the European *acquis communautaire*. These laws lay down a number of general rules and requirements affecting the production of bioenergy in the main relevant sectors, namely forestry, agriculture, waste and animal farming. The main environmental law is the Sustainable Development Act (1995), which serves as the basis for all environmental legislation and policies in Estonia. It is complemented, *inter alia*, by the Environment Monitoring Act (1999), the Environmental Impact Assessment and Environmental Management System Act (2005), the Integrated Pollution Prevention and Control Act (2001), the Environmental Supervision Act (2001), the Nature Conservation Act (2004), the Environmental Liability Act (2007) and the Waste Act (1998).

The sectors relevant for bioenergy production in Estonia are therefore comprehensively governed by the above-mentioned laws, imposing detailed obligations on environmental impact assessment, environmental permitting, monitoring and supervision as well as liability to restore damage to the

natural environment. These laws also contain provisions on public participation in environmental decision-making and on the introduction of invasive alien species.

MEXICO: The Bioenergy Law can be said to contain comprehensive environmental guarantees through express inclusion of environmental concerns in its objectives and its explicit references to applicable environmental laws such as: the Law on Sustainable Rural Development; the General Law for Ecological Balance and Environment Protection; the General Law on Forest Life; the General Law on Sustainable Forestry Development; the Law on Biosafety; the Planning Law and the international conventions to which Mexico is a party.

In addition the case study draws attention to the detailed and coordinated institutional framework contained in the Bioenergy Law with regards to environmental protection. Specific institutional mandates have been devised to this end: the Secretary of Environment and Natural Resources (SEMARNAT) is responsible to ensure that the activities regulated by the Bioenergy Law are compatible with the preservation, restoration and sustainable use of natural resources and biodiversity, to evaluate the sustainability of programmes and activities based on the law and ensure the respect of applicable environmental laws. In addition, the Secretary for Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) and the Secretary for Energy (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.

The case study further points to the importance of integrated implementation of the Bioenergy Law and the General Law on the Prevention and Management of Waste (2003), which could otherwise potentially lead to legal uncertainty for projects that generate electricity from forest residues and waste. The production of energy from waste falls within the scope of the latter piece of legislation. The Law on the Prevention and Management of Waste contains provisions detailing the division of responsibilities between the federal government, the states, the federal districts and the local governments in waste management and use. The Bioenergy Law confers the power to the Mexican Energy Ministry to grant the permits necessary for the production of all forms of bioenergy, including bioenergy production from waste, which could conflict or cause an overlap of functions with that of other federal or state authorities in charge of waste management and use.

PHILIPPINES: The objectives of the Biofuels Act (2007) include "to reduce dependence on imported fuels with due regard for the protection of public health, the environment, and natural ecosystems consistent with sustainable economic growth that would expand opportunities for livelihood..." (section 2). The Act does not, however, provide more detailed environmental guarantees. This contrasts with the Renewable Energy Law (applicable to biomass), which contains a provision devoted to environmental compliance subjecting renewable energy projects to an environmental compliance certificate.

Another interesting point of the Biofuels Act as regards environmental protection is that it exempts biofuel production facilities from the wastewater discharge fees under the Clean Water Act, as one of the economic incentives to spur investments in the industry. This exemption may appear problematic in light of the fact that ethanol plants are among the most polluting industries and would otherwise be expected to pay the highest wastewater discharge fees. On the other hand, the author of the case study argues that, because bioenergy operators are not exempt from the obligation to secure a discharge permit, the wastewater discharge fee exemption only applies if the company meets the effluent standards. The relevant provisions of the Biofuels Act may thus very well provide an incentive to biofuel producers to comply with environmental standards in order to qualify for such an exemption.

TANZANIA: According to the case study, Tanzania's environmental legislation provides a relatively strong legal basis for environmental protection with respect to bioenergy activities. The influence of the Convention on Biological Diversity can be seen in Tanzania's first environmental policy in 1997 as well as in the Environmental Management Act (2004), which lays down a comprehensive legal framework inspired by the polluter pays principle and the precautionary principle. According to the author of the case study, environmental impact assessment is required for bioenergy projects.

THAILAND: The case study on Thailand reveals challenges in enforcement of forestry laws and policies, and insufficient environmental and cost-benefit analyses concerning biofuels production. The primary drivers of the Thai policy for renewable energy and bioenergy seem to be economic ones, which may have led to an insufficient consideration of the potentially harmful environmental impacts of using biofuels. For instance,

while the policies to promote the use of Gasohol 95 may initially reduce carbon dioxide emissions, economic incentives and lower fuel prices may encourage more fuel use and more traffic congestion and pollution. The legal guarantees for environmental sustainability are limited to a provision of the Energy Industry Act that empowers the Energy Regulatory Board to determine the criteria, procedures and conditions for energy industry operation, including environmental standards.

3.2 Environmental impact assessment

ARGENTINA: The Biofuels Law requires that before granting permits to biofuel production facilities, the law requires the latter submit an environmental impact assessment including information on the treatment of effluents and waste management. The case study reveals that in practice however, such considerations do not lead to an additional layer of protection, but simply rely on pre-existing controls at provincial level as the Secretary of Energy demands only the permits awarded by provinces where facilities will be located as proof of compliance with environmental norms. Environmental requirements for the construction of new facilities are governed by provincial legislation (and therefore subject to much variation) as well as land-use planning instruments.

In addition, it emerges from the case study that environmental impact assessments are not required for regular agricultural activities, although some provinces have specific requirements to issue deforestation permits that include environmental impact assessment and public participation requirements.

BRAZIL: According to Resolution No. 1 (1986), as amended, of the National Commission on Environment, the activities that are subject to environmental impact assessments include bioenergy-related ones such as agro-industrial complexes and units, including alcohol distilleries; any activity using charcoal or similar products in quantities exceeding 10 tonnes per day; and agricultural projects exceeding 1 000 hectares. This instrument also stipulates that EIA must follow state or municipal regulations and shall include at minimum: an environmental diagnosis of the area affected by the project; an analysis of impacts of the project and its alternatives; identification of mitigation actions; and a monitoring programme of positive and negative impacts. An EIA summary is to accompany information containing alternative options for the justification of the project's

compatibility with sectoral and governmental programme, which is to be made available to the public for comment.

MEXICO: The Bioenergy Law makes explicit reference to the procedures for environmental impact assessment contained in the Law for Ecological Balance and Environmental Protection (1988), the Law on Biosafety as well as legislation governing the forest sector. The first of these laws mandates a preliminary environmental impact assessment authorized by SEMARNAT for the cultivation of crops or algae for biofuels production that may threaten the preservation of any species or damage ecosystems. Importantly, the law also directs SEMARNAT to carry out environmental impact assessment studies prior to granting authorizations for land use changes thereby minimizing possible damage or ecological imbalance to the concerned area.

PHILIPPINES: The Environmental Impact Statement System Law of 1978 requires that all public or private entities prepare an environmental impact assessment for every proposed undertaking that may significantly affect the quality of the environment. This law is buttressed by Presidential Proclamation No. 2146, which declares certain areas and types of projects as environmentally critical. Activities involving heavy industries that are resource-intensive or take place on prime agricultural lands, among others, fall within the scope of the environmental impact statement system. Information requirements concern the expected impacts including any adverse ones, short-term and long-term effects, and the use of renewable or non-renewable resources.

TANZANIA: According to the case study, Tanzania's EIA regulations may be considered adequate because they give sufficient notice for the general public to provide comments and call for the organization of public hearings. The Environmental Management Act, however, does not specify how the comments made by the public should be integrated in the course of decision-making.

THAILAND: The Enhancement and Conservation of National Environmental Quality Act (1992) includes provisions on project types requiring an environmental impact assessment that can be relevant for large-scale bioenergy projects. For instance, large-scale CDM projects are required to conduct an EIA and submit a report to the Office of the Natural Resources and Environmental Policy and Planning. The EIA process also

incorporates public participation and mandates the consideration of views of experts into environmental decision-making. However, the case study highlights that there have been negligible efforts to carry out cost-benefit analysis, environmental evaluation or environmental impact assessments prior to the installation of biofuel production projects and plants.

3.3 Specific protection of forests and biodiverse areas

ARGENTINA: As one of Argentina's most important export, soy occupies more than half the land devoted to agriculture: an area which has quadrupled since the 1990s encroaching on forests, wetlands and other areas rich in biodiversity. Several provinces did not previously have land-use planning strategies, so left the decision to landowners as to whether or not to maintain forest cover or deforest the land. The 2007 Native Forests Law was introduced to rectify this situation. It encourages all provinces to adopt a land use planning strategy for native forests; those failing to do are required to refrain from issuing any further deforestation permits. This piece of legislation establishes that all deforestation of native forests will require a permit by local authorities, granted in addition to an environmental impact assessment and following public participation procedures.

BRAZIL: The Forest Code determines the percentage of forest areas that may be used for productive activities and sets out limitations on deforestation for agricultural and charcoal production (Law No. 4771, 1965 last revised in 2006). The authors of the case study consider this as a key instrument ensuring the environmental sustainability of biofuel production. The Forest Code further establishes Permanent Preservation Areas to protect riparian vegetation and any logging in these areas requires federal authorization. Authorities are also empowered under the law to determine other permanent preservation areas, for example to prevent erosion (art. 3). Cutting is allowed on the condition that a stipulated portion (which can be altered by EEZs) must be left as a 'legal reserve', where only sustainable activities may be performed. These portions are: 80 percent in rural forest properties within the Amazon states; 35 percent on rural savannah properties within the Amazon states; 20 percent on rural forest, native vegetation properties in other regions; and 20 percent in rural properties on general farming areas in any region of the country.

In addition to the these general legal requirements, the case study draws attention to the use of voluntary mechanism where by the private sector has

agreed to a moratorium not to use soy cultivated on deforested areas of the Amazon Biome after 24 July 2006. Other aspects of the commitment relate to monitoring soybean plantations in the Amazon biome and raising awareness of the importance of complying with environmental regulations.

ESTONIA: The forest sector, which plays a key role with regard to bioenergy production in Estonia, is governed by the Forest Act (2007), which lays down detailed rules designed to regulate forest management and ensure the sustainable use of forest resources. The Forest Act also contains detailed provisions on the rights and obligations of private forest owners and on stakeholder consultations. Furthermore, it contains detailed provisions designed to guarantee that the general public is able to take advantage of the social and cultural benefits associated with forests.

MEXICO: As one of the laws explicitly recalled in the Bioenergy Law, the General Law on Sustainable Forestry Development covers the conservation, protection, restoration, production, cultivation, management and use of the forest ecosystems and forest resources. One of the specific objectives of the law is the consolidation of permanent forest areas, thereby avoiding land use changes for agricultural purposes which affect forests' permanence and potential. Biofuel cultivation which entails cutting or deforestation therefore falls foul of the law.

Implicitly, the Bioenergy Law also makes relevant the General Law on Forest Life that covers fauna and flora species that are under threat or rare and that have a special status whose sustainable use requires a special permit and the establishment of Environmental Management Units. The law also provides that the objective of the national forest policy to achieve forest conservation through protection and sustainable use, while maintaining and promoting the restoration of its diversity and integrity. The use of forest waste to produce biofuels would be a sustainable forest use.

Some policies also contain relevant environmental protection elements. The Climate Change Strategy, for instance, refers to the need to preserve Mexican agrobiodiversity through programmes jointly implemented by SEMARNAT and SAGARPA. In addition, the Agricultural and Fisheries Sectoral Programme 2007–2012, which was developed by SAGARPA to promote the diversification of agricultural products, cautions against the use of forestland for the cultivation of crops for bioenergy.

PHILIPPINES: In addition to the Biofuels Act, the Presidential Decree on the Environmental Impact Statement System lays down regulations on large-scale plantations (including energy crops such as jatropha) if these are located in public lands (those classified as forestlands or protected areas, regardless of its actual forested condition). Currently, there are, however, no provisions on invasive alien species, although the Wildlife Act mandates the Department of Environment and Natural Resources to develop regulations on the matter.

Through its National Integrated Protected Areas System Act the country benefits from a framework that sets aside portions of forestlands as protected areas, thereby subjecting activities carried out therein to tight regulation with a view to protecting resources and biodiversity. The clearing of forests for plantations or other purposes is prohibited in these areas.

TANZANIA: There are sectoral environmental laws and subsidiary legislation affecting Tanzania's legal framework for bioenergy, including the Forest Act (2002). The case study, however, indicates that the Environmental Management Act is too general and does not offer any specific measures for dealing with land degradation caused by unsustainable agricultural practices. The National Strategy on Land Management, in turn, empowers the relevant minister to issue guidelines for forest harvesting and trading in forest produce, among others. These may serve as quick responses to the danger of land degradation, as their issuance is considerably less costly and time-consuming than the enactment of regulations.

THAILAND: Overall, the case study indicates that despite the environmental legislation and the principle of 'sufficiency economy' in the Tenth National Social and Economic Development Plan (2007–2011), the state of the environment in Thailand has been affected by over forty years of economic growth and lack of sufficient enforcement of the existing environmental laws. Thus, there are a number of critical environmental threats such as deforestation and encroachment of protected areas that are considered relevant for the bioenergy sector. For instance, deforestation has occurred in alarming rate in large part due to lack of sufficient enforcement of forest legislation.

4. SOCIAL GUARANTEES

This section synthesizes the country reviews of bioenergy policy and legislation of Part II from a social perspective, exploring themes relating to food security; land tenure, management and use planning; employment and rural development.

4.1 Food security

In some countries, the production of bioenergy from energy crops has given rise to concerns over national food security: producing biofuels can be economically more attractive than food production, especially given financial incentives to promote the creation of national markets for bioenergy. Of the seven case studies, questions concerning food security were particularly important in Mexico, where specific legal provisions were made to ensure the availability of corn, the key crop for Mexican diets. In Estonia, conversely, where forests constitute the main source for bioenergy and the forested area has increased due to abandoned agricultural land, food security concerns have not emerged. As soy – the crop currently used for biodiesel production in Argentina – is a product that does not feature prominently in Argentine diet, food security concerns in relation to bioenergy have not been raised there either.

BRAZIL: It emerges from the case study that scattered provisions in the legal framework relate to food security. For instance, the four guiding principles of the types of technical assistance to be provided by biofuel producers to family farmers under the Social Fuel Seal scheme explicitly state food security and sovereignty as a goal, together with sustainable production systems; generation of income; and reducing rural poverty.

Interestingly, the case study makes reference to the Ministry of Agriculture Ministerial Resolution (*Portaria*) 54 establishing agricultural zoning for sugar cane in the State of Rio Grande do Sul for the period 2008–2009, which incorporates a food security criterion as one of the limiting factors in the production of bioethanol.

MEXICO: The prevalence of food security concerns in Mexico can be explained by the fact that this country is already suffering from a problem nicknamed 'ethanol inflation', whereby the price of corn – a key crop for Mexican diets – has arguably increased significantly due to ethanol

production in the United States. Accordingly, an earlier proposal for a law on bioenergy, vetoed by the President, was criticized for "feeding cars instead of humans". Conversely, the Bioenergy Law has as one of its main objectives the protection of food security and promotion of food sovereignty in Mexico, making express reference to the Law on Sustainable Rural Development.

The Bioenergy Law empowers the Secretary of Environment and Natural Resources to periodically review and publicize the impacts of bioenergy programmes on food security and sovereignty. In setting up a permitting system for carrying out activities and services related to the production, storage, transport, distribution and marketing of bioenergy, the Bioenergy Law further provides that permits to produce biofuels from corn are only granted in case a national surplus production exists. The effectiveness of this provision by itself in addressing food security concerns is questionable, however, given that Mexico is not self-sufficient in corn production and its food security is therefore affected also by the price of corn on international markets and not only by the existence of national surplus production. The Bioenergy Law also contains relatively strong language on research and development focusing on new uses of non-food products and the diversification of crops for biofuels production and should be beneficial for Mexico's agricultural sector and food security.

Furthermore, a draft law on planning for agricultural food and nutrition sovereignty and security, which was approved by the Lower House of the Parliament in March 2006 and is currently before the Senate, could complement the provisions outlined above. This draft law underscores the importance of strategic food products on a national level in order to meet the population's basic needs. The case study notes that the draft law would enable a preference to be given to the cultivation of crops for food purposes over biofuels.

THE PHILIPPINES: There are fears that biofuels production could compete with food production in the Philippines. In fact, one of the lead authors of the Biofuels Act has proposed that the Act's implementation be deferred due to persistent concerns related to land use and food security. According to the case study, no studies are available on the impact of the increased production of biofuels on the agricultural sector. Unless such comprehensive studies are conducted, the public opinions are based on speculations.

One authority that is relevant for administering the relationship between biofuels production and food security in the Philippines is the Sugar Regulatory Administration, mandated to ensure adequate sugar supply at all times to meet domestic demand. The role of the Sugar Regulatory Administration has been explicitly acknowledged in the Biofuels Act, as the sugar industry is estimated to be the main contributor to the production of biofuels.

TANZANIA: Issues relating to food security are regulated in Tanzania by the Food Security Act (1991) designed to guarantee strategic grain reserve. The Act creates a Board of Trustees to oversee and coordinate the activities of the government aimed at procuring, storing and releasing grain for security purposes and preparedness for any crisis in the country. In addition, one of its provisions state that the Food Security Act will prevail over conflicting provisions in any other laws. Though the Act is not detailed with regard to specific food crops, it entails the possibility to address any emerging food security issues in Tanzania by empowering the minister to pass regulations on any matter related to the effective implementation of the Act (section 14).

Significantly, the primary goal of the Agricultural and Livestock Policy of 1997 is to guarantee basic food security and to augment the national standards of nutrition by boosting the output, quality and availability of food commodities. The policy also lays emphasis on meeting these goals through increased productivity, while drawing attention to the benefits of earning foreign exchange through 'cash crops' exports.

THAILAND: The creation of a Committee on Food Security in 2008 enabled a coordinated national debate on how to ensure that a switch in demand for fuel does not impact negatively on agricultural production for food.

4.2 Land

In some countries, plans to increase the production of bioenergy derived from wood-based biomass or energy crops can have important ramifications for land use involving areas set aside for food production, protection of biological diversity and forested areas, and for the preservation of cultural spiritual or traditional practices of indigenous and local communities. The importance of land use considerations depends largely on the specific

circumstances of each country, and each case study has highlighted different aspects, sometimes related to land tenure, sometimes to sustainable land management and land use planning.

ARGENTINA: Notwithstanding the positive development effect that having a high-value export crop as soy generates on local communities, serious concerns have been raised about the total area devoted to soy monoculture in Argentina using technological packages with genetically modified seeds. The area has quadrupled since the 1990s and moved into lands previously unsuitable for agricultural activities, altering valuable ecosystems like forests and wetlands.

Environmental concerns associated with the expansion of the agricultural frontier in Argentina have led to the adoption of the Native Forest Law that establishes a moratorium on the issuance of any new deforestation permits, until land planning strategies for native forests are adopted by each of the different provinces. Although most experts contend that biodiesel production is unlikely to alter or produce any significant impact on existing patterns of agricultural production, the adoption of the Native Forests Law constitutes an important step towards the coherent regulation of land use planning by the different provinces and the protection of vulnerable ecosystems.

BRAZIL: Besides pointing to highly divisive issue of land tenure arrangements in the Amazon that may have impacts on or be exacerbated by bioenergy projects, the case study highlighted land use planning through ecological-economic zoning regulations (ZEE). The main mechanism for the implementation of these zoning strategies is the tying of governmental agricultural subsidies and credits to ZEEs. In the case of bioenergy crops, it has yet to be defined how the ZEE will be linked with other existing agricultural zoning strategies (like those based on climatic and hydrological conditions), as well as strategic environmental assessments and environmental licenses, although zoning is already used for the cultivation of sugarcane in Brazil. A 2009 Ministerial Resolution, for instance, established agricultural zoning for sugar cane in the State of Rio Grande do Sul for the period 2008–2009 using a map of climate risks, as well as incorporating a food security criterion as one of the limiting factors in the production of bioethanol. The zoning criteria for bioenergy reportedly will incorporate the general criteria applicable to agricultural zoning along with cropland limitations based upon political aims to preserve: primary vegetation,

sensitive ecosystems (mainly the Amazon rainforest and Pantanal), Indian Reserves, conservation areas (national and state parks) and areas considered strategic for food security (mainly soybean, corn, cotton, bean and rice).

ESTONIA: The case study highlights how existing legal provisions on land tenure and use may hinder bioenergy development. Nearly half of the abandoned agricultural land is owned by the state. According to the Land Reform Act (1991), it is possible for producers to use such land by usufruct. Some producers could be interested in using the state-owned, unused agricultural land for willow plantations to produce bioenergy from fast-growing trees. However, according to the Land Reform Act, the usufruct of land is possible for 10 years only, whereas the lifetime of a short-rotation plantation can be up to 25 years.

MEXICO: The Law on the Promotion and Development of Bioenergy specifically provides that no land use change from forest to agricultural land should be carried out for the cultivation of energy crops. The Secretary of Environment and Natural Resources is specifically mandated to ensure this.

In addition, certain provisions of the law specifically address soil protection: biofuels production should be compatible with the natural use of the soil and not alter the ecosystem balance and should maintain the soils' physical integrity and productive capacity. Furthermore, bioenergy crop cultivation must avoid practices that cause erosion, degradation or which adversely modify the topographical characteristics of the cultivated area. 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. In addition, the Secretary of Environment and Natural Resources 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.

PHILIPPINES: The Philippines does not have a comprehensive legal or policy framework for land-use planning. Nonetheless, the case study refers to a newly created bicameral oversight committee tasked with holding public hearings on the effects of biofuel farming on land use policy in order to prevent indiscriminate biofuel development. Significantly, the Biofuels Act does not address the question of land rights and transparency of land

agreements between local or indigenous communities with respect to the land and water resources to be used for the cultivation of energy crops.

Land use is thus largely determined by local government units through local zoning ordinances within their political jurisdictions. Local government decisions on zoning though are mainly concerned about tax rates and identifying areas for urban development. There are no national standards or guidelines on how decisions are to be made by either a national agency or local government on whether farmland is to be used for biofuel or food production. The Environmental Impact Statement System sets regulations on large-scale plantations (including energy crops such as jatropha) if these are located in public lands (those classified as forestlands or protected areas, regardless of its actual forested condition). Currently, there are no regulations on alien invasive species, although the Wildlife Act mandates the Department of Environment and Natural Resources to develop regulations on this matter.

TANZANIA: The Tanzania case study provides the most in-depth look at land issues out of the countries under review. Issues related to land-use planning are governed by the new Land-Use Planning Act (2007), establishing land planning commissions from the national level to the village level. Depending on their jurisdictions each designated land planning authority is responsible for preparation and supervision of land-use plans. The National Land-Use Planning Commission has the overall responsibility for land use plans in Tanzania, and is also responsible for the preparation of the national land use plan. All villages, districts and regions are required to have land-use plans, which are subject to registration.

The Act does not specify which land should be used for the cultivation of energy crops, but it has been left to the villages, councils and districts to determine which land areas are suitable for that purpose. The Act is thus based on a bottom-up rather than top-down approach, allowing local communities to determine how their land should be utilized. The law is quite new and the experience with the former Land Planning Commission Act (1984) shows that preparation of land use plans is quite demanding in terms of time and money, and most of the villages are poor and cannot afford to implement them.

The case study also highlights that the Land Act and the Village Land Act seem to provide adequate protection to property rights. Importantly for the

production of biofuels, the Land Act (1999) contains provisions on the allocation of lands to investors. In practice, this takes place through the Tanzanian Investment Centre. As a general rule, non-citizens cannot be allocated land for other than investment purposes. Registers of land areas suitable for investment purposes are kept by the Tanzanian Investment Centre through the land bank scheme. In accordance with the Village Land Act (1999), the allocation of village land for non-villagers is subject to approval by the village assembly. The poverty level of village land holders, however, especially in rural areas, means they are often in a weaker bargaining position in the negotiations with investors. The author of the case study also noted that the original title to land is vested with the President of Tanzania, who is also empowered to acquire land for public purposes under the Land Acquisition Act (1967). The right to land in Tanzania through the right of occupancy under the Land Act can only be granted for a period not exceeding 99 years after which the title reverts back to the government.

The case study also highlights problems related to desertification and land degradation in Tanzania. Issues related to sustainable land management are addressed by the Environmental Management Act (2004) and the National Strategy for Sustainable Land Management and Protection of Water Catchments Areas (2006). The latter lays down a comprehensive five-year programme to address twelve key challenges and promote the development of renewable and alternative energy sources especially in dry land areas and address the problem of deforestation.

THAILAND: In Thailand, the key laws concerning land use questions are the Land Code (1954) and the Land Reform for Agriculture Act (1975). The Ministry of the Interior is responsible for regulating land use. For bioenergy projects, the provisions of the Land Code prohibiting foreign individuals and companies from owning land in Thailand can also be relevant. There are, however, some exceptions under the Investment Promotion Act (1977) and the Foreign Business Act (1999), as well as for projects under the Thailand Board of Investment and the Industrial Estate Authority.

4.3 Employment, rural development and community-based production

As the case study on Argentina demonstrates, bioenergy policies and laws may have a significant impact on rural populations when both cultivation areas and main biofuel facilities are located in rural areas. The same case

study points out those detrimental effects may be seen in regions where soy monoculture displaces traditional livestock farming practices. Several other case studies addressed questions related to rural development and employment, as synthesized in this section.

ARGENTINA: The Biofuels Law contains several provisions supporting small and medium-sized enterprises (SMEs), for example its stipulation that the Ministry of Federal Planning should prioritize SMEs as well as promoting agricultural production and regional economies in the allocation of fiscal benefits. The law also provides provisions for supporting SMEs purchase of capital goods for biofuels production and for endorsing research, cooperation and transfer of technology among small and medium-sized enterprises and relevant institutions. Social considerations are clearly espoused in provisions of the Biofuels Law that allocate fiscal benefits to projects or industries according to: (i) the promotion of small and medium-sized enterprises, (ii) agricultural production, and (iii) regional economies. Furthermore, the Biofuels Law states that blending facilities selling gasoline and diesel must first purchase fuel from the biofuel plants of beneficiaries of fiscal incentives, at prices defined by the Secretary of Energy, and only when their supply is consumed can purchase from other plants be allowed. The author of the case study, however, notes some shortcomings in this regard, namely: complex procedures, excessive discretion of the implementing agency in defining the recipients of the fiscal benefits, and the lack of credit opportunities or technical support for small and medium-sized enterprises.

BRAZIL: The Social Fuel Seal scheme in Brazil is the most notable example in the country reviews of where economic benefits for bioenergy production are tied to fulfilling socially advancing criteria. Biodiesel producers are mandated to comply with three conditions in order to benefit from the scheme. First, a percentage of the overall feedstock used must be from smallholders (the precise figure depends upon regional locations – higher proportions are set for more socio-economically disadvantaged regions). The second stipulation is that producers must negotiate and sign contracts with the family farmers concerned, or an organization representing them. Third, in those contracts the price to be paid for the feedstock must be detailed (including conditions and the deadline for feedstock delivery), as well as an outline of the technical assistance to the families that will be provided to the families. According to the authors of the case study, the impacts of this scheme are significant: at the 14th auction, 80 percent of biodiesel purchase was from firms with the Social Fuel Seal.

However, concerns have recently arisen that the social impact of the scheme would be diminished following a lowering of required percentage in one of the areas in 2009 on the grounds that small-holders were unable to keep up with production capacities, therefore necessitating a reduction in percentage to enable operations to continue legally. Furthermore, approaches which may see a flat rate of 30 percent requirement across all regions to provide benefits to areas where soybean flourishes has been criticised on the same grounds – i.e. that the 'social' objectives of the seal were precisely to promote family agriculture in the poorest and most disadvantaged regions, not those with the highest rates of production.

The case study notes that compliance with labour laws and standards is not comprised among the Social Fuel Seal eligibility requirements. Voluntary agreements favouring corporate social responsibility are instead used to address the most serious violations of labour law. A National Pact for the Eradication of Slave Labour comprises private actors that have agreed not to use feedstock from firms that have been found to impose working conditions analogous to slavery and have been included on an online list published by the Ministry of Labour and Employment (Ministry of Labour, Portaria No. 540, 15 October 2004).

Social impacts were finally taken into account also in the implementation of the ban on destructive practices related to bioenergy production (sugarcane field burning), with the commitment for private companies to re-train workers that were negatively affected by the mandated mechanization of bioenergy crop production.

MEXICO: The Bioenergy Law includes among its objectives specific reference to the need to stimulate rural sector activities, generate employment and improve the quality of life of the population, especially that of marginalised communities. Furthermore, it creates specific institutional mandates to this effect. The Bioenergy 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 employment 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.

PHILIPPINES: The policy objectives underlying the Biofuels Act include the protection of public health and increased livelihood from biofuel production – all contributing to balanced economic growth.

The Biofuels Act outlines responsibilities for the Department of Labour and Employment linked to providing certain social guarantees in the bioenergy sector, for example promoting livelihood and employment opportunities, providing access to workers in the biofuels industry to social coverage and making recommendations in biofuels policies and programmes which further their social benefits. Under the Sugar Amelioration Act of 1991, workers in this industry benefit from a system of production sharing. According to the Biofuels Act, the National Biofuels Board is responsible for establishing a similar mechanism for biofuel workers.

TANZANIA: The case study identifies the Occupational Health and Safety Act (2003) and the Employment and Labour Relations Act (2005) as legal instruments providing adequate social guarantees for those employed in the biofuels sector.

THAILAND: The case study highlights government support to community-based bioenergy production, through a pilot Community Biodiesel Production Plan that aimed at promoting biodiesel production and use in 72 communities across the country, in order to reduce local communities' expenses on energy by producing and using biodiesel from used cooking oil or other oil plants grown in the community, such as jatropha in order to replace diesel use. Technical assistance is also to be provided through learning centres which demonstrate biodiesel production, financing pressing and biodiesel processing machines, as well as conducting training and information sharing on farming oil crops.

Other government programmes include a Small Power Producers Initiative in 1992 and a "very small renewable energy power producers" programme in 2002.

Finally under the Investment Promotion Act (1977), additional benefits are allocated to producers located in least developed areas of Thailand, such as deductions for infrastructure costs and public utility costs, an additional 50 percent reduction in corporate income tax for up to ten years and further deductions for infrastructure installation and construction costs.

5. INSTITUTIONAL FRAMEWORK AND PUBLIC PARTICIPATION

In principle, effective national policies and programmes for bioenergy benefit from clearly defined institutional mandates, inter-institutional cooperation and coordinated implementation of sectoral laws. At the same time, provisions for public participation and transparency are important to guarantee the legitimacy of the national legal framework in an area that can have important implications on the interests of various actors from private enterprises and consumers to small-hold farmers and local communities. In most of the selected countries, special committees or similar bodies were created to advice on national laws and policies on bioenergy. Often such bodies included representatives from various ministries and other government agencies, as well as the private sector. However, according to the case studies, not all of these bodies were satisfactory in terms of broad participation by all the relevant stakeholders (particularly non-governmental ones) and transparency in the functioning.

ARGENTINA: The Biofuels Law and its regulatory decree created an adequate institutional set up for bioenergy regulation and clearly allocated tasks to different government agencies. Furthermore, inter-institutional coordination is provided through the creation of a National Advisory Commission on Biofuels. According to the biofuels legislation, however, private institution 'may' contribute to the fulfilment of the tasks allocated to the Implementing Authority, but they are not permanent members of the Commission. In practice, the National Advisory Board serves as a mechanism for interagency information sharing, but does not participate in the final stages of policy-making, which are usually defined by the Secretary of Energy.

With a view to enhancing transparency, the Biofuels Law requires an updated public registry of permits awarded to biofuel production and processing plants to be maintained together with a list of those firms that receive promotional benefits (to be made available online). Other information that must be published includes reference prices for biofuels which provides an annual estimate of the total volume of biofuels required to meet domestic market needs. Nonetheless, a concern expressed by different stakeholders is the lack of transparency in decision-making by authorities, as the public information requirements set out in the Biofuels Law have not been

complied with yet, and the National Advisory Commission on Biofuels lacks visibility and transparency in the conduct of its proceedings.

BRAZIL: The Brazil case study highlights numerous examples of multi-sectoral agencies responsible for implementing policies, formulating programmes and in general regulating the biofuels sector. Under the Ministry of Energy, the National Agency for Biofuels and the National Council for Energy Policy are the primary institutions for bioenergy created by the National Energy Policy Law. The Council was set up as an interagency body, the secretariat of which is made up of, among others, the ministers of: mines and energy; science and technology; planning, budget and management; finance; environment; development, industry and foreign trade; national integration; and agriculture. Thus, interagency coordination and information exchange and dialogue can take place through this forum. In addition, the Council is one of rare examples in which participation of non-governmental stakeholders is provided for: energy experts from civil society and academia chosen by the President of Brazil may participate in the meetings of the Council.

Another example of institutional integration in Brazil is the Inter-ministerial Sugar and Alcohol Council, which acts as an inter-ministerial steering committee with representatives from the finance, development, industry and foreign trade, and energy government sectors. This interagency entity coordinates current policy and is responsible for the development of new policy.

With respect to public-private partnerships, the Agroenergy Plan 2006–2011 intended the creation of a consortium to guide research and development but has not yet come to fruition as Brazilian law mandates that government investment of public funds must remain entirely under governmental control. To side-step this obstacle, Embrapa has sought the formation of a purpose-specific company that would conform to Brazilian public-private-partnerships law from which this consortium could be set up.

As to biodiesel, the institutional framework preceding the Programme for the Production and Use of Biodiesel, displayed a similar set-up to the policy formation and implementation bodies of the bioethanol program. Both the Executive Inter-ministerial Commission on Biodiesel, responsible for policy design, and the Managerial Biodiesel Group, responsible for policy implementation, comprise representatives from 13 other ministries. There

are also instances of public consultation, for example with respect to the Social Seal programme: changes in percentages resulting from a regular review of the programme by the Executive Inter-ministerial Commission on Biodiesel and the Managerial Biodiesel Group, involve consultation with stakeholders. The case study draws attention to normative instructions that were adopted following the public consultation process.

ESTONIA: The institutional framework in Estonia is well-developed with clear mandates for each of the relevant ministries as well as provisions for inter-institutional coordination. The Ministry of the Environment plays a key role in the forestry sector as well as climate change policies, while the key institution in the energy sector is the Ministry of Economic Affairs and Communications. Estonian legislation also contains elaborate provisions on public participation, including the Forest Act (2007) and various environmental laws. The formulation of Estonia's forest policy has been characterized as one of the most participatory processes in the country's history.

MEXICO: One of the strengths of the Mexican Bioenergy Law is its elaborate and detailed establishment of a supportive institutional framework for bioenergy activities. The Inter-secretarial Bioenergy Commission is responsible for ensuring inter-institutional coordination. Importantly, several inter-institutional cooperation and coordination mechanisms outside the framework for bioenergy have been put in place through other laws that nevertheless impact the bioenergy sector. These coordination entities 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 – the latter including also participation from non-governmental stakeholders. The Planning 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.

It is interesting to note, however, that permits required under the Bioenergy Law for carrying out activities and services related to the production, storage, transport, distribution and marketing of bioenergy are granted by the Secretary for Energy, while an important part of bioenergy production reportedly related to energy crops and agricultural activities falls within the domain of the Secretary for Agriculture. The law provides, however, that the

permits are to be granted in consultation with the Inter-secretarial Bioenergy Commission, where also the Secretary for Agriculture is represented.

The Mexican case study highlights a degree of lack of transparency in the permit approval process. The author thus recommended that these issues should be kept in mind when adopting secondary legislation to implement the Bioenergy Law. The case study also stresses that the participation of the private sector in the development of Mexico's legal and policy framework for bioenergy should be enhanced.

THE PHILIPPINES: The Biofuels Act lays down provisions on the institutional framework for biofuels. The principal institution in charge of the implementation of the Act is the Department of Energy with its responsibilities clearly defined

The Act also creates the National Biofuels Board in which various ministries as well as the Philippine Coconut Authority and the Sugar Regulatory Administration participate. The tasks of the National Biofuels Board relate to implementation of the biofuels programme and making policy recommendations. On a critical note, the case study notes that the Department of Environment and Natural Resources is not given a role in the implementation of the Biofuels Act, even if environmental issues are mentioned as one of the Act's objectives. Notwithstanding the fact that the Board is well-represented by the major sectors concerned, the Department of Environment and Natural Resources is not included.

Significantly, the Biofuels Act also contains provisions on stakeholder participation in crafting the implementing rules and regulations of the Act: it mandates that the formulation of secondary legislation must be conducted in consultation with stakeholders and concerned agencies, and that prior to its entry into force, the draft of the implementing rules shall be posted on the Department of Energy website for at least one month and published in at least two newspapers of general circulation. However, in contrast to the recent trends in environmental legislations, there are no civil society or private sector representatives in the policy-making body, the National Biofuels Board. This is a critical gap, especially because the success of the law hinges entirely on private sector participation – investments in biofuel production, distribution and use.

TANZANIA: Though there is no specific legislation currently in force on bioenergy from energy crops which would have provided for a clear layout of institutional mandates, in March 2006 the government created the National Biofuels Task Force consisting of representatives from various ministries such as Ministry of Food and Agriculture, Ministry of Energy, Ministry of Planning and Privatization and other relevant private sector and the civil society actors. The task force is one of the few exceptions to take on board views of different non-governmental groups in the formulation of biofuels guidelines.

The Petroleum Supply Act, also applicable to biofuels, identifies the Tanzanian Energy and Water Utilities Regulatory Authority as the authority responsible for granting licences in operators in the petroleum sector. The Act also lays down provisions concerning inter-institutional cooperation. Accordingly, environmental authorities would be involved in the classification of projects in the petroleum sector that require environmental impact assessment.

The Environmental Management Act (2004), the Constitution of the United Republic of Tanzania of 1979 (as amended in 2000) and the Forest Act (2002) contain provisions on public participation.

THAILAND: Thailand has made several special institutional arrangements for bioenergy. In general, the national energy policy is guided by the National Energy Policy Council chaired by the Prime Minister and including representatives from several ministries and other state agencies. In 2005, the government also appointed a Committee on Biofuel Development and Promotion, which acts as a focal point for matters relating to biofuel policy making, monitoring and promotion. Also relevant for bioenergy is the National Commission on Climate Change Policy, created in 2006 and chaired by the Prime Minister. Nonetheless, according to the case study, inter-institutional coordination continues to be a challenge. The government is in the process of establishing a more rigorous direction for Thailand's alternative energy strategy including ensuring policy coordination amongst government agencies and other public and private actors.

The Energy Regulatory Board is empowered to issue licenses for energy industry operation and to determine the criteria, procedures and conditions for energy industry operation. These include, *inter alia*, requirements for the use of renewable energy and environmental standards.

Concerning public participation, the Enhancement and Conservation of National Environmental Quality Act contains provisions on the right of individuals to access information and the duty of individuals to assist and cooperate in enhancing and protecting the environment. The Energy Industry Act also advocates the participation of the local communities and the general public in the management and monitoring of energy-related operations.

6. TRADE, INVESTMENT AND CARBON FINANCING

In many countries, laws and policies designed to promote bioenergy are closely connected with market regulations as well as with the legal framework applicable to international trade and investment. As the case studies in this report illustrate, national legal frameworks for bioenergy bring to the fore questions related to the WTO Agreements, such as tariffs, product standards, sustainability criteria and agricultural subsidies. In Estonia and other members of the EU, concerns over the sustainability of the 10 percent target for biofuels by 2020 have lead to the adoption of a European directive laying down sustainability criteria for domestically produced and imported biofuels, including the requirement that imported biofuels do not originate from lands with high carbon stock or high biodiversity. In countries like Argentina, some concerns have been voiced identifying the need to avoid costly certification procedures and bureaucracies associated with the EU's sustainability scheme. Similar concerns also emerged from the case study on Tanzania. The case studies on Thailand and Tanzania also highlight the role of agencies designed to promote foreign investment in implementing national bioenergy programmes. In Tanzania, for example, international investors are an important force driving the development of the national bioenergy industry and benefiting from various incentives administered by the Tanzanian Investment Centre.

In all of the seven case studies, carbon financing also held some potential in promoting the national bioenergy sector. In Estonia, three different carbon financing mechanisms were available, namely the EU Emissions Trading Scheme as well as joint implementation and emissions trading under the Kyoto Protocol. The impact of the EU ETS in Estonia is to increase the economic attractiveness of bioenergy by imposing a price on carbon dioxide emissions, whereas the two Kyoto mechanisms could be used to attract international carbon financing for bioenergy projects in Estonia. Of the six

other countries classified as non-Annex I countries under the UNFCCC and the Kyoto Protocol, all had benefited from carbon funding under the Clean Development Mechanism. However, the case studies reflected general problems concerning the regional distribution of CDM projects: Tanzania was hosting only one registered CDM project and focused on capacity building activities – reflecting a common trend in Africa, while the Latin American and Asian countries had much more extensive CDM project portfolios. In Mexico and the Philippines, concerns emerged over the impact of mandatory blending requirements for biofuels on the 'additionality' of CDM projects in the sector. In the Philippines, the government attempted to address this issue through a special provision indicating that the Biofuels Act does not affect the additionality of CDM projects in the Philippines.

As questions concerning international trade and carbon finance depend largely on international legal rules, the scope for innovative legislative solutions at the national level is more limited than concerning questions addressed in the previous sections. It will be interesting to see, for example, how the CDM Executive Board will treat the provision indicating that the Biofuels Act does not affect the additionality of related CDM projects in the Philippines. On the other hand, the EU ETS and plans to launch a Green Investment Scheme in Estonia can be mentioned as examples of the potential of carbon financing to promote bioenergy and other renewable energy source beyond the CDM.

ARGENTINA: As the third largest producer of soybeans and largest exporter of soybean oil, Argentina is taking advantage of its capacity to develop a biodiesel industry and has already built export-oriented facilities with a capacity to produce 1.5 million tonnes of biodiesel per year. Argentina's prospects for exporting ethanol, on the contrary, are not as good as those for biodiesel, as the former is affected by import tariffs imposed by the United States and the European Union.²

The biodiesel industry in Argentina is also wary of new environmental requirements put in place by the European Union. Most of Argentina's production should be in line with said requirements, and may in fact benefit from a shift away from palm oil. It will be important, however, for authorities to maintain active participation in the process, including through consultations between Mercosur and the EU, to prevent the establishment of

² Both the EU and the US place a tariff of over US\$ 0.50 per gallon (3.78 lts) of ethanol.

costly bureaucratic procedures or certification schemes that may violate WTO rules. A Mercosur group on biofuels was created in December 2006 to present a common regional strategy towards export markets regarding tariff and non-tariff barriers to trade. Participation in WTO meetings on environmental goods and services (where the issue of reducing tariffs for biofuels was presented by Brazil) have, however, not yet been approached as a regional strategy.

Regarding the CDM, Argentina has ten projects registered by the CDM Executive Board, three of which relate to bioenergy. However, biodiesel plants are waiting for specific CDM methodologies for biodiesel production to be adopted by the CDM Executive Board in order to make better use of this mechanism. The expected average annual CERs from CDM projects in Argentina amount to 2.04 percent of the total contribution by all CDM registered projects. Argentina's participation in the CDM is, therefore, still limited in comparison to such other countries in Latin America such as Brazil and Mexico.

ESTONIA: Unlike in countries hoping to supply the growing international markets for biofuels or develop their national biofuels industries, questions concerning incentives for bioenergy exports and foreign investment are not prevalent in Estonia. However, Estonia is currently exporting some 17 percent of its wood-based bioenergy, including briquettes and pellets. These are sold to Northern European countries such as Finland and Sweden. Bioenergy exports from Estonia are thus governed by the legal rules and principles applicable to the EU's internal market, designed to guarantee the free movement of goods, services, capital and people.

Discussions on national implementation of the EC Directive on the promotion of the use of renewable energy sources highlights, however, the relevance of the WTO and international trade law for national legal frameworks on bioenergy. The relevance of these considerations from the perspective of the Estonian national legislator is, however, limited. Any legal challenge of the EC directive at the WTO would fall under the competence of the European Community rather than the Estonian national government.

Carbon trading plays an important role in the legal framework for bioenergy in Estonia. The country participates in the EU's Emissions Trading Scheme, which increases the economic attractiveness of bioenergy in comparison to fossil fuels by setting a price for carbon dioxide emissions. Estonia also hosts

four Joint Implementation projects related to bioenergy in accordance with Article 6 of the Kyoto Protocol. Potential for more JI bioenergy projects has been estimated to exist. Meanwhile, Estonia is also investigating possibilities to establish a Green Investment Scheme to enhance its possibilities to participate in emission trading under Article 17 of the Kyoto Protocol. Carbon funding through the scheme could constitute an additional source of funding for bioenergy projects.

MEXICO: In terms of carbon trading and the CDM, Mexico is one of the most important CDM host countries and currently holds a 10.5 percent share of the CDM market. Under the CDM, 110 projects from Mexico have been registered of which 33 of these are bioenergy projects. Most of the Mexican bioenergy projects (28) relate to methane recovery and electricity generation from animal manure, while 5 are based on electricity generation from landfill gas.

The Mexican case study identified the additionality requirement applicable to all CDM projects as an important obstacle for bioenergy projects that are either very profitable, not facing major barriers or part of the national policy. As discussed in Part I of this study, these requirements are based on the international rules for the CDM. In general, they are seen as a guarantee for the environmental integrity of the Kyoto Protocol and emissions reductions credited through the CDM. The regulatory barrier relating to the CDM is therefore something that cannot be addressed through Mexico's national legal framework for bioenergy but is intimately connected to decisions by the CDM Executive Board and the parties to the Kyoto Protocol. At present, significant changes to the additionality requirements seem highly unlikely. On the other hand, questions concerning the CDM and carbon funding are playing a key role in the ongoing negotiations for the post-2012 international legal framework for climate change after the expiry of the first commitment period under the Kyoto Protocol. It remains to be seen whether this could lead also to some changes concerning the additionality requirement.

THE PHILIPPINES: One of the main motivations for the biofuels policy in the Philippines has been to reduce the country's dependence on imported fossil fuels. On the other hand, the Biofuels Act contains some provisions to allow tariff-free imports of biofuels in cases of inadequate domestic supply.

The Biofuels Act specifically states that its provisions shall not be interpreted as prejudicial to CDM projects that reduce the emissions of carbon dioxide

and other greenhouse gases by means of biofuels (Sec. 18, RA 9367). This provision should be understood in the light of the requirement adopted by the Parties to the Kyoto Protocol that CDM projects must be additional and not fall under the "business as usual" scenario set up of the country owing to a specific mandate for the setting up of biofuel plants. This provision thus attempts to pre-empt the determination of additionality by the CDM Executive Board under the Protocol. At best it clarifies that, while biofuel projects are encouraged and are becoming numerous, these projects are still not the norm.

TANZANIA: The Tanzanian Investment Act (1997) contains a number of incentives for investors meeting the minimum investment capital requirements, which are higher than those for Tanzanian investors. The Tanzanian Investment Centre (TIC) provides a number of services for investors and after receiving a certificate from the TIC, investors enjoy a number of benefits including exemption from the import duty and deferment of the value added tax on project capital goods, favourable investment allowances and deductions on corporate tax. Also a number of other incentives may be possible (Investment Act, sections 20 and 23). In practice, multinational companies investing in the bioenergy sector in Tanzania are registered with the TIC and taking advantage of the incentives.

Importantly for the production of biofuels, the Land Act (1999) contains provisions on the allocation of lands for investors. In practice, this takes place through the TIC. As a general rule, non-citizens cannot be allocated land other than for investment purposes (section 20.10). In accordance with the Village Land Act (1999), the allocation of village land for non-villagers is subject to approval by the village assembly (section 8.1).

Tanzania is also taking steps to improve its capacity to benefit from carbon funding under the CDM. It is currently hosting one registered CDM project relating to landfill gas recovery and electricity generation and two more bioenergy projects are under development. A capacity building project for the CDM in Tanzania, known as 'the CD4CDM', is also ongoing in cooperation with the UNEP Risoe Centre.

THAILAND: Since November 2006, the Thai government has prioritized the promotion and production of biofuels. The Thailand Board of Investment (BOI) has drawn up incentives in accordance with the Investment Promotion Act (1977) to stimulate investment in the Thai

ethanol industry, including duty free imports of necessary equipment, eight-year corporate tax exemption, expanded land ownership rights for foreign investors beyond those contained in the Land Code (1954) and additional benefits for producers located in North-East of Thailand as well as in the extreme South. The BOI is currently supporting 28 ethanol projects.

Concerning trade, exports of ethanol for liquor are allowed but the sale of Thai-produced ethanol for energy purposes to foreign consumers is prohibited. However, given surplus supply, the Department of Alternative Energy Development and Efficiency is currently considering changing this restriction. On the import side, the Export and Import Act (1979) empowers the Minister of Commerce to restrict imports absolutely or conditionally for economic stability, public interest, public health, national security, peace, order, morals or any other reason in the national interest. The case study mentions palm oil as an import that may be prohibited for health and safety reasons. At present, the imports and exports of palm oil are restricted under the Fuel Trade Act (2000).

The case study recommends that further emphasis should be placed on strengthening the legal framework in which CDM projects are developed and implemented in order to attract foreign direct investment. The author also noted, in this regard, that the Foreign Business Law (1999) restricts foreign investment in 43 business sectors, including agriculture and forestry. Investment in these sectors is only possible through a joint venture with a Thai company.

7. CONCLUSIONS: OPTIONS FOR SUSTAINABILITY

The case studies confirm the importance of a **holistic approach** in devising effective national policy and legal frameworks to ensure the environmental and social sustainability of the bioenergy sector. The Tanzania case study provides the clearest evidence that, even in the absence of specialised legislation, existing laws and policies of sectors relevant to bioenergy can create a supporting or enabling environment for the development of a domestic bioenergy industry.

The existence of a general policy and legal framework addressing matters related to bioenergy does not take away the utility of **specialized legislation** expressly targeting bioenergy. All the countries analysed in this report had

either recently enacted such legislation or taking steps towards doing so. Bioenergy laws in Argentina and the Philippines have established mandatory blending requirements for bioethanol and biodiesel in the transport sector and provide economic incentives for the development of the national biofuels industry. In Mexico, the recent Law on the Development and Promotion of Bioenergy governs both liquid biofuels and bioenergy derived from the decomposition of biomass. In Tanzania, the National Biofuels Task Force is preparing guidelines for biofuels and has recommended the development of an act on biofuels. The Thai Government is actively promoting renewable energy, including bioenergy, and contemplating legislative measures to implement its 8 percent target by 2011 and increase the consumption of biofuels in the transport sector. For Estonia, the legislative instruments and policies of the EU concerning climate change, renewable energy sources and biofuels in the transport sector play an important role in the existing and future national legal framework for bioenergy. Brazil's biofuels program is currently hailed as one of the most advanced in the world, following thirty years of government initiatives and support.

The development of bioenergy-specific legislation still needs to take into account pre-existing legislation directly or indirectly related to bioenergy. Possibly bioenergy legislation should establish **clear linkages with other sectoral laws** to facilitate interpretation and coordinated implementation. This is the approach adopted in Mexico, where the Bioenergy Law contains clear references to other relevant legal instruments that create social and environmental guarantees related to bioenergy. Another interesting example is that of the Philippines, where the Biofuels Act exempts biofuel production facilities from the wastewater discharge fees provided under the Clean Water Act, but does not release operators from the obligation to secure a discharge permit: thus, the wastewater discharge fee exemption only applies if the company meets the effluent standards. Overall, synergies should be created between bioenergy law and legislation on trade and investment, environmental protection (including environmental impact assessment), biodiversity, climate change, land (including land tenure, sustainable land management and land-use planning), water, rural development, food security and labour.

Other key ingredients for comprehensive legal frameworks for bioenergy include **institutional coordination**. The creation of multi-sectoral advisory bodies may be useful in institutionalizing dialogue and exchange of

information among different national authorities, albeit care must be exercised to ensure transparency and truly multi-sectoral and multi-stakeholder participation. Some challenges in this respect have been identified in the case studies. In the Philippines, for instance, the National Biofuels Board, where various sectors are well-represented to ensure the balancing of various interests, does not include the environmental authority. In Brazil's National Council for Energy Policy, energy experts from civil society and academia may participate if chosen by the President of Brazil, but only on an ad hoc basis. Argentina's National Advisory Board serves as a mechanism for interagency information sharing, but does not participate in the final stages of policy-making. Thus decisions are ultimately made by the Secretary of Energy without sufficient transparency. Only in few instances multi-sectoral bodies include civil society representatives, as in the case of the National Biofuels Task Force of Tanzania. Thus, legal drafters should ensure that coordination mechanisms include all interests related to or potentially affected by bioenergy, and allow relevant representatives to have timely, effective and transparent interactions with the ultimate decision-makers. Participation by non-governmental stakeholders should also be specifically envisaged by the law, as in the case of the Philippines, where the Biofuels Act contains provisions on stakeholder participation in crafting the implementing rules and regulations of the Act.

Transparency requirements may also be useful with regards to bioenergy producers and operators. In the Philippines, any individual or entity intending to engage in the production of biofuels shall apply for accreditation as a biofuel producer with the Department of Energy and to register their distributors with the Department, as well as submit monthly reports on production, sales, inventory and weekly price of biofuels. In Argentina, the Biofuels Law requires the creation and maintenance of an updated public registry of permits awarded to biofuel production and processing plants together with a list of those firms that receive promotional benefits (to be made available online). This may facilitate monitoring by authorities as well as by enabling interested stakeholders, thereby building trust towards bioenergy operators.

All case studies demonstrate that to be effective and create the necessary changes in economic and market conditions, policies aiming to promote bioenergy should be backed by legislation that lays down **incentives for bioenergy production** and **obligations for consumption of bioenergy** (such as blending requirements). However, the case studies also illustrate that

without comprehensive assessments and realistic estimates on the impact of biofuels production on agriculture, food security, land use, land tenure and environmental protection, a purely economic focus to render bioenergy commercially viable and to reach energy independence and security will not be sufficient for sustainability and success of these initiatives. In addition, discretionary limits with respect to the design and allocation of incentives should be built in relevant legislation, as highlighted in the case study on Argentina. Flexibility should at the same time be preserved. Overall, targets and blending requirements are likely to be most successful if the figures are progressive; flexible enough to respond to changing or unforeseen economic, social or environmental circumstances; and in conformity with installed (and carefully calculated projections of future) production capacity to prevent bottlenecks in the supply. They should be set through a multi-sector, transparent and possibly participatory process, with a view to limiting discretion of national authorities thereby building trust and understanding among relevant stakeholders and providing security for investors. What is more, incentives should be carefully drafted so as to avoid negative impacts on the realization of other policy objectives (most notably, environmental and social ones) or possibly to actively support also the realization of environmental and social policy objectives. The latter approach is exemplified by Brazil's Social Fuel Seal.

With regards to **environmental sustainability**, various legal options have emerged. Although scattered across different types of legislation, general environmental provisions can be effective in preventing land use changes in favour of the production of crops for biofuels in environmentally sensitive areas such as lands rich in biodiversity or having a high carbon stock. Thailand's Enhancement and Conservation of Natural Environmental Quality Act, for example, establishes general environmental principles that should be reflected in laws and regulations concerning the energy, industrial and transport sectors. Forest law may also have an impact on wood-based bioenergy. The Estonian Forest Act, which aims to ensure the protection and sustainable management of forest as an ecosystem, through its detailed provisions on forest management restricts felling volumes, thus limiting the availability of wood resources for energy production. In Brazil, ecological-economic zoning regulations are expected to function as one of the primary tools for ensuring the sustainability of biofuel production. They have already contributed with respect to sugarcane to incorporate a food security criterion as one of the limiting factors in the production of bioethanol. This instrument is still been developed and seems to have the potential to also address

environmental issues such as the protection of primary vegetation, sensitive ecosystems, Indian Reserves and conservation areas (national and state parks).

Large-scale bioenergy projects may fall under general provisions of **environmental impact assessment** (EIA) legislation, which usually also provide for significant opportunities for public participation. In Tanzania, EIA regulations include in the list of projects requiring an EIA several activities that may be linked to the large-scale production and storage of biofuels. Thailand's legislation explicitly requires large-scale CDM projects to be subject to an EIA. In Estonia, in line with European legislation, an environmental assessment is also requested for policies and strategies (the so-called strategic environmental assessment), which may be a significant tool to ensure the environmental sustainability of bioenergy policies and programmes.

On the other hand, **specific environmental guarantees** can be built into bioenergy legislation. These may take the form of legal provisions on objectives, as in Mexico where the bioenergy law explicitly aims at contributing to sustainable development and decreasing air, soil and water pollution. Similarly, the Philippines' Biofuels Act declares as its objective the promotion of environment-friendly fuel alternatives. Statement of policy objectives may be a useful reminder to bioenergy authorities and operators, although they may need to be implemented in more detailed legal tools, or at least not contradicted by more detailed provisions. The Philippines' Renewable Energy Law (applicable to biomass), for instance, contains a provision devoted to environmental compliance subjecting renewable energy projects to an environmental compliance certificate.

Another approach can be that of devising **institutional mandates** related to environmental sustainability. In Mexico, specific clauses stipulate that the Secretary of Environment will apply GMO regulations 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. The Secretary of Environment is also in charge of ensuring that no land use change from forest to agricultural land is carried out to cultivate biofuels crops, and for evaluating the sustainability of programmes and activities based on the law and ensuring the respect of applicable environmental laws.

Other tools identified in the case studies for environmental sustainability include: the prohibition of specific destructive practices used for bioenergy production (such as sugarcane field burning in Brazil), the inclusion of bioenergy in environmental permitting systems and land use management planning, and certification of environmentally sustainable bioenergy production. An additional legal tool may also be that of supporting research aimed at determining the environmental conditions for the production of bioenergy, as is the case in Mexico.

With regards to **social guarantees**, these may be enshrined in general labour and rural development laws, but may also be included in specific clauses of the bioenergy law. The latter approach has been adopted in Mexico where the bioenergy law explicitly aims at promoting the economic development of rural populations. Social guarantees may also be explicitly made part of **institutional mandates** in bioenergy legislation. In the Philippines, the Biofuels Act lists among responsibilities for the Department of Labour and Employment promoting livelihood opportunities and productive employment; ensuring the access by workers to productive resources and social coverage; and making recommendations for plans, policies and programmes that will enhance the positive social impacts of the National Biofuels Programme. In Mexico bioenergy-specific legislation provides that the ministries that participate in the Bioenergy Commission must address social issues.

Another interesting tool is that of providing **incentives** to ensure an effective integration of social concerns in the bioenergy sector. In Thailand, for instance, legislation provides for additional benefits for producers located in least developed areas. In Brazil, federal taxes are reduced to zero for biodiesel produced from family farmers in the North, Northeast and semi-arid areas. In addition, a **certification system** for biofuels, the Social Fuel Seal, ties tax incentives, federal credit and government-led procurement of biodiesel to the satisfaction of requirements that promote regional socio-economic development by requiring the integration of smallholders into the biodiesel production chain. The Social Fuel Seal allows biodiesel producers who source a percentage of their input from feedstock produced by smallholders to receive certain fiscal incentives and to sell their biodiesel in national auctions to satisfy the regulatory blending requirement.

Legal or other measures should also facilitate access to credit for the construction of biofuel facilities by **small and medium-sized enterprises**.

The Argentina case study provides an example of other support measures for SMEs. Furthermore, legislation may create a basis for bioenergy initiatives favouring or targeting local and indigenous **communities**. These initiatives can also exist without legislation, as in the case of Thailand, where in 2006, the government launched the Community Biodiesel Production Plan. However, a solid legal basis for this type of initiatives may significantly contribute to empowering local communities and providing them the necessary legal certainty to invest in bioenergy production and use. Legislation should also allocate responsibility for the provision of financial resources and technical support to communities to this end, and support research in the area of community-based and small-scale bioenergy production.

Interesting legal options have also been identified with regards to **food security**. Mexico's Law on the Promotion and Development of Bioenergy explicitly establishes that biofuels production should not threaten the country's food security and sovereignty, and clearly links to the Law on Sustainable Rural Development. In addition, it creates an obligation for the Secretary for Agriculture to periodically review and publicize the impacts of bioenergy programmes on food security and sovereignty. In Tanzania, the legislation clarifies that the Food Security Act will prevail over conflicting sectoral legislation, thus food security concerns will take precedence over energy security issues when it comes to the production and consumption of crops. Emerging legal options therefore include: enshrining food security among the objectives of bioenergy laws, including consideration of food security in the mandates of bioenergy institutions, including specific reference to food security legislation in bioenergy laws, mandating conservation of food security concerns in zoning (as discussed in the case study on Brazil) and management planning, supporting research related to food security and bioenergy, creating institutional mandates to monitor and report on food security impacts of bioenergy, and prioritizing biodiversity projects containing food security guarantees in permitting processes.

Several **land** issues have emerged in the case studies. Land tenure may be affected by bioenergy project, and this may raise particular concerns when indigenous people or disadvantage sectors of society may be negatively affected. In Tanzania villages are empowered to negotiate the terms of foreign investment on their lands, but actual capacity and resources may hinder the effectiveness of these legal guarantees. Land use planning may also be a useful tool, when integrated in forest management (in the case of

Argentina) or in ecological zoning (as in the case of Brazil). Finally, issues related to sustainable land use may be relevant. The Mexican Bioenergy Law specifically incorporates provisions specifically devoted to avoiding soil degradation in the bioenergy sector. Relevant legal options may therefore include: integrating land-related issues in the objectives of bioenergy laws and in their institutional mandates, mandating consideration of land-related issues in bioenergy decision-making and permitting systems, and linking certification of bioenergy production with good land use practices. In addition, legal provisions should request the consent of concerned indigenous and local communities when land traditionally belonging or used by them may be impacted by bioenergy projects, as well as ensuring that technical assistance and other support may be provided to them by the government and other actors, upon request.

Finally, it should be noted that legal instruments can be effectively coupled with policy instruments and even **voluntary initiatives** to achieve a sustainable bioenergy sector. The Brazilian case study has shown how voluntary agreements or formalized partnerships between government entities, the private sector and NGOs may significantly help in achieving social and environmental goals within the bioenergy sector.

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3. Vicuña conservation legislation, 1971 (E* S*)
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5. Agrarian law and judicial systems, 1975 (E* F* S*)
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