

ANNEX II - The Regional Dimension

This section describes key regional agreements and preferential agreements enabling analysis the implications of the regional context for national policies and targets. Please note that the WTO and its treatment of biomass energy products was discussed in depth in Section 2.5 as the key international trade body.

1 EUROPEAN UNION

The European Union (EU) has enacted bioenergy policies that are legally binding for Member States and therefore has been addressed in-depth. EU policies that influence directly and indirectly biofuel and bio-electricity production are ruled by a series of EU directives and regulations. EU Directives require Member States to achieve a particular result. Although Directives leave the Member Countries free to choose the means of achieving that result, the provisions and targets indicated in the directives are binding on the Member States. If a Member State fails to pass the required national legislation, or if the national legislation does not adequately comply with the requirements of the Directive, the European Commission may initiate legal action against the member state in the European Court of Justice

Common Agriculture Policy (CAP), and particularly its reform (in 2003) had a great impact in promoting biofuel production. CAP through its regulation²⁰⁹, is directly absorbed into Member Countries' legislation without requiring national legislation.

In the following paragraphs main policies affecting bioenergy deployment are presented.

1.1 Overview

In the past decade, production and use of biofuels has increased substantially in the European Union. In 2005, 3.9 million tons of biofuel were produced. Biodiesel is the most important biofuel in the EU representing around 8 percent of Biofuels.²¹⁰ The sector has undergone very rapid growth with a 28.2 percent annual production increase since 2000- with Germany keeping its leading position with a production of more than half (52.4 percent) of EU biodiesel production. The main feedstock used is rapeseed (about 80 percent) and the rest is mainly from sunflower oil and soybean oil.²¹¹

Bioethanol represents 18.5 percent of the biofuels being used in transport in the EU²¹². Main feedstocks are sugar beet and cereals. EU industry has been slower in investing in ethanol production consequently ethanol production will not be sufficient to meet the demand. As a result, bioethanol imports are expected to increase in 2006, 2007, and will likely continue through 2010.

Biofuel related trade regimes²¹³:

a) bioethanol. The EU imported more than 250 million litres of ethanol during the period 2002-2004. 30 percent of this volume was imported as normal Most Favoured Nation trade and subject to specific import duties (tariff) of euro 0.102/litre on denatured alcohol (HS 2207 20) and euro 0.192/litre on undenatured alcohol (HS 2207 10). The remaining 70 percent of EU alcohol imports entered under preferential trade arrangements as the Generalized Systems of

²⁰⁹ Differently from Directive, Regulation is a legislative act of the European Union which becomes immediately enforceable as law in all member states simultaneously.

²¹⁰ EurObserv'ER, Barometre des Biocarburants, May 2006

²¹¹ US-FSA report "EU-25 Bio-Fuels- Biofuels Annual 2006", GAIN Report Number: E36102, 7/11/2006

²¹² EurObserv'ER, Barometre des Biocarburants, May 2006

²¹³ data from UNCTAD, "The emerging biofuels market: regulatory, trade and development implications", United Nations 2006

Preferences (GSP). From 1 January 2006 to 31 December 2008, according to the new GSP Regulation, tariff reduction for either denatured or undenatured alcohol will be not applicable any longer. However, unlimited and duty-free access to denatured and undenatured alcohol are eligible if the exporting country adheres to an incentive scheme for sustainable development and good governance. Duty-free and quota-free access is granted to the Less Developed Countries under the Everything But Arms (EBA) Initiative and under the Cotonou Agreement, (ACP countries).

b) biodiesel. No significant external biodiesel trade has occurred, against a relevant internal trade. An ad valorem duty of 6.5 percent is applied to EU imports of biodiesel

Biomass electricity has increased from a yearly growth of 7 percent in previous years to 13 percent in 2003 and 23 percent in 2005. Biomass in 2005 contributed 70 TWh.²¹⁴

1.2 Objectives and Drivers

A variety of policy goals have motivated the EU to promote the production and use of bioenergy and biofuels.

Mitigation of CO₂ emissions, reduction of its dependence on imported fossil fuels and therefore improvement of security of energy supply security, are the main drivers.

However bioenergy policies are also directed toward creating new opportunities for sustainable rural development in the EU Member States.

1.2.1 Bioenergy Policy by Sub-sector

The main EU strategy for Renewable Energy Sources (RES) development was set in the European Commission's White Paper for a Community Strategy (1997) that identified a strategy to increase the overall share of renewable energies in gross domestic energy consumption to 12 percent by 2010. The Commission's most recent initiative, the *Renewable Energy Road Map*, proposed new, legally binding targets for renewables in the EU's energy mix (20 percent by 2020) and for biofuels in transport ("minimum target" of 10 percent by 2020). Those targets subsequently endorsed by the EU Council at the 8-9 March 2007 Summit. The Commission, however, refused to set any other sector-specific targets, arguing that Member States need flexibility in promoting renewables according to their potential and priorities. *Biomass Action Plan*²¹⁵ and the 2006 *Strategy for Biofuels*²¹⁶, complete the strategy framework aimed to improve both the supply and demand for bioenergy and biofuels.

The *EU Biomass Action Plan* sets a target of doubling the current 4 percent biomass share in total energy consumption by 2010 encouraging Member States to establish national biomass action plans (nBAPs) aimed at removing the main national bottlenecks to market deployment of bioenergy in all sectors.

²¹⁴ Renewable Energy Road Map Renewable energies in the 21st century: building a more sustainable future Brussels, 10.1.2007
COM(2006) 848 final

²¹⁵ 8COM(2005) 628 final, Brussels, 7.12.2005.

²¹⁶ 9COM(2006) 34 final. Communication from the Commission: An EU Strategy for Biofuels, Brussels, 8.2.2006.

The *Strategy for Biofuels* provides an overall strategy for a sustainable production and use of biofuels.

Agriculture policies

Bioenergy support has also been introduced in the Common Agriculture Policy, a system of agricultural subsidies and programmes representing about 44 percent of the EU's budget, especially following its reform in 2003. By cutting the link between payments made to farmers and the particular crops they produce, the reform allowed them to take advantage of new market opportunities such as those offered by biofuels.

A special aid of €45 per hectare is available for energy crops grown on non set-aside (traditional food crop areas land). In addition, while farmers cannot cultivate food crops on set-aside land²¹⁷, they can use this land for non food crops including biofuels and are eligible to receive compensatory payments per hectare (since 2005 these payments are included in the single farm payment).²¹⁸

The change in subsidies is intended to be accomplished by 2011, but individual governments are free to choose the modality through which the new scheme will be introduced.

Support to bioenergy comes also from the new EU rural development policy which includes measures to support renewable energies, as grants and capital costs for setting up biomass production eligible for support from local and regional administration within EU rural development policy.

Power Generation

The EU legislative framework for electricity production from RES is set by Directive 2001/77/CE²¹⁹, also known as the RES-E Directive. It sets an EU-wide reference target of 22 percent of RES share in electricity production by 2010 and obliges Member States to a) establish national targets for future consumption of RES-E b) assure guaranteed access for RES-E; c) issue guarantees of origin of RES-E and d) assure that the calculation of costs for connecting new producers of RES-E should be transparent and non-discriminatory.

Concerning the support systems for RES-E, the Directive abstains from proposing a harmonised Community-wide support system.

Three main types of public support have been used by Member States to support the achievement of the above targets:

²¹⁷ Under the Common Agricultural Policy (CAP), EU farmers are required to set aside 10 percent of their land to qualify for arable aid payments. The intention is to promote biodiversity by ensuring sections of land are not used for crop growth

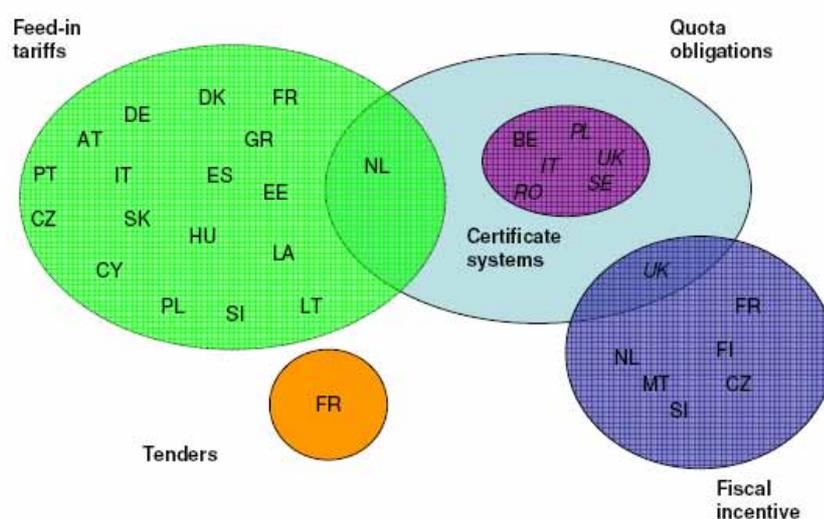
²¹⁸ Under the SPS the farmer is no longer paid different amounts according to the crop he produces, but a set amount per hectare of agricultural land maintained in 'Good Agricultural Condition' or in return for specific rural development activities (such as diversification or setting up producer groups) or for carrying out particular land management activities that benefit the environment. See EU. Policies Restricting Current and Potential Biofuels Exports from Developing Countries (from EU and U.S. Policies on Biofuels: Potential Impacts on Developing Countries GMF public)

²¹⁹ Directive 2001/77/CE on the promotion of the electricity produced from renewable energy source in the internal electricity market

- 1) feed-in tariffs, a fixed price on electricity by which producers can sell renewable power into the electric power network²²⁰;
- 2) quota obligations and tradable renewable energy certificate mechanism;
- 3) fiscal incentives (as VAT reduction or subsidized interests on investment, or other tax credits) and capital subsidies/grants; and
- 4) other schemes such as the RECS (*Renewable Energy Certificate System*), based on RECS-certificate that can be issued on the voluntary market for every MWh of renewable energy.

All Member States have now published their national RES electricity targets, independently of the support system or scheme in force. Overall progress in the Member States is well advanced. However, some have introduced support systems for renewable power, while others have introduced “green certificate” schemes. Most Member States are maintaining their “feed in” systems as it is shown in Figure 1.1.

Figure 1.1 - Supporting schemes for RES-E in EU-27 countries



Source EC, from “State of Play at EU-Level, current initiatives and legislative measures” presented at the European Photovoltaic Industry Association Roundtable Brussels 14/05/2007

Heat (Residential/Commercial)

Although the heating and cooling sector represent the 50 percent share of the final energy and present a huge potential for the use of renewables, its growth has been rather slow compared to the growth rates achieved in the renewable electricity and transport sectors²²¹.

This is due mainly to the existing EU legislative vacuum in the heating from renewable sources sector.

²²⁰ Some Member Countries have provided a fixed tariff while others provided a fixed premium to market- or cost- related tariffs. Some provide both

²²¹ Estimates of heat production are not reliable as for the electricity and transport sector. In fact a significant part of the heat that is produced escapes detection in national statistics due to both less regular accounting practices and because of the significant share of on-site internal consumption in waste treatment process and in industrial processes.

Although the European Parliament called for a dedicated Directive, the European Commission announced in January 2007 to instead put forward a Framework Directive on renewable energy covering heating and cooling together with the electricity and transport sectors. Such Framework Directive is foreseen to be issued at the end of 2007.

The policy framework for the promotion and development of high efficiency cogeneration of heat and power (CHP) is set by the EU Directive 2004/8/EC²²².

Cogeneration aimed at energy saving is considered an important measure to help EU Member States to comply with Kyoto obligation.

Transport

EU biofuel legislation consists of three main Directives. The first pillar is Directive 2003/30/EC²²³ for promotion of biofuels market in the European Union. In order to encourage biofuel use competing against less costly fossil fuels the Directive sets a voluntary “reference target” of 2 percent biofuel consumption (on the basis of energy content) in 2005 and 5.75 percent by 31 December 2010. It obliges Member State to set national indicative targets for the share of biofuels, in line with reference percentages of the Directive, although leaving them free to choose a strategy to achieve these targets. Member States must also report to the European Commission before 1 July of each year on the measure taken to promote the use of biofuels and, if needed, the reasons why the targets have not been met.

The second pillar is Directive 2003/96/EC²²⁴ which allows application of favourable tax deduction on biofuels. These tax exemptions are considered as environmental state aid, therefore their implementation from Member Countries require authorization from the Commission in order to avoid undue distortions of competition. However, being tax policy not part of the sphere of action of the European Community, each EU Member State decides on the level of taxation for fossil and biofuels.

The third pillar of the EU biofuel legislation relates to environmental specifications for fuels indicated in Directive 2003/17/EC amended in 2003²²⁵. It set limits on biodiesel blending to no more than a 5 percent share by volume for technical reasons, posing an obstacle to achieving the targets set in the Biofuels Directive. As indicated in the Biofuel Strategy the Fuel Quality Directive will be revised to help reaching the 5.75 percent target by 2010.

1.3 Results and Future Challenges

Results achieved reflect differences in the regimes for electricity, biofuels and heating and cooling established at EU level: clear growth in electricity; the recent start of solid growth in biofuels; and slow growth rates for heating and cooling.

²²² EU Directive 2004/8/EC on promotion of cogeneration based on a useful heat demand in the internal energy market

²²³ Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport

²²⁴ Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity (also known as Energy Taxation Directive)

²²⁵ Directive 2003/17/EC (known as EU fuel quality directive) amending directive 98/70/EC relating to the quality of petrol and diesel fuels

Electricity: substantial progress has been made in the electricity sector, on the basis of the Directive on renewable electricity adopted in 2001, and the targets set will almost be met. Biomass electricity has gone from a yearly growth rate of 7 percent in previous years to 13 percent in 2003 and 23 percent in 2005.

Heating and cooling: renewable energy in heating has grown slowly. Biomass use dominates renewable heating consumption and the bulk of this is in domestic wood heating. Little growth has occurred in the use of efficient wood-burning stoves and boilers, or biomass CHP (for industrial use), despite their potential for reducing emissions.

Biofuels for transportation: a good rate of progress- a doubling in two years- has occurred in biofuels sector. As Table 1.1 shows, by 2005 biofuels were in use in almost all 21 Member States. Their market share reached an estimated 1 percent²²⁶.

Table 1.1 - Progress in the use of biofuels in the Member States, 2003-2005

Member State	Biofuel share 2003 (%)	Biofuel share 2004 (%)	Biofuel share 2005 (%)	National indicative target 2005 (%)
Austria	0.06	0.06	0.93	2.50
Belgium	0.00	0.00	0.00	2.00
Cyprus	0.00	0.00	0.00	1.00
Czech Republic	1.09	1.00	0.05	3.70 ²⁴
Denmark	0.00	0.00	no data	0.10
Estonia	0.00	0.00	0.00	2.00
Finland	0.11	0.11	no data	0.10
France	0.67	0.67	0.97	2.00
Germany	1.21	1.72	3.75	2.00
Greece	0.00	0.11	no data	0.70
Hungary	0.00	0.00	0.07	0.60
Ireland	0.00	0.00	0.05	0.06
Italy	0.50	0.50	0.51	1.00
Latvia	0.22	0.07	0.33	2.00
Lithuania	0.00	0.02	0.72	2.00
Luxembourg	0.00	0.02	0.02	0.00
Malta	0.02	0.10	0.52	0.30
The Netherlands	0.03	0.01	0.02	2.00 ²⁵
Poland	0.49	0.30	0.48	0.50
Portugal	0.00	0.00	0.00	2.00
Slovakia	0.14	0.15	no data	2.00

²²⁶ Biodiesel accounted for about 80 percent of this, bioethanol 20 percent (about 15 percent in the form of the additive ETBE). From "Biofuels Progress Report on the progress made in the use of biofuels and other renewable fuels in the Member States of the European Union"(COM(2006) 845 final)

Slovenia	0.00	0.06	0.35	0.65
Spain	0.35	0.38	0.44	2.00
Sweden	1.32	2.28	2.23	3.00
UK	0.026 ²⁶	0.04	0.18	0.19 ²⁷
EU25	0.5 %	0.7%	1.0 %(est.)	1.4 %

Source: national reports under the biofuels directive. From Biofuels Progress Report on the progress made in the use of biofuels and other renewable fuels in the Member States of the European Union (COM(2006) 845 final)

Thanks to a favourable EU biofuels legislation, the EU has become the world leader in the production and consumption of biodiesel, although biodiesel use varies from country to country, with Germany, France and Italy being the largest biodiesel producers and users. To win the acceptance and confidence of consumers and vehicle manufactures, much attention has been paid to quality control, particularly in Germany.

The reason for the large share of biodiesel is that the majority of the cars in the EU are diesel cars, and as such there is a diesel deficit and a gasoline/diesel demand that pose a challenge for ethanol in the coming years.

This demand imbalance and the cheap imports of bioethanol from external countries impeded EU bioethanol industry to develop as the biodiesel, although increase of EU ethanol production is expected in the coming years.

Currently, locally produced biofuels are not cost-competitive in the EU. Production costs are still high, mainly due to high-priced internal feedstocks while biodiesel is already competitive with oil (though not necessarily with imported biodiesel), bioethanol is still far from it. Ethanol in Europe is produced from sugar beets and wheat, both of which are much more expensive than sugarcane derived ethanol.

Consequently, the competitiveness of EU-produced biofuels will depend on subsidies, and in the case of bioethanol on import tariffs as well. Possible diminishing production costs may, however, change the situation in the years to come. This is why the European Commission has included biofuels second generation technologies and improved production methods as a priority area in its VII Framework Programme on Research.

Two main types of subsidies are provided from the EU to support the biofuels industry and foster consumption in Member States: tax exemptions on biofuels and subsidies to agricultural producers given within the Common Agriculture Policy framework.

Tax exemption policies have been implemented in many countries. These policies have enabled indirect subsidies for biofuel compared to fossil fuels²²⁷ considering the high fuel taxes currently in force in most Member Countries.

Due to budget concern about cost of maintaining fiscal incentives, several Member States started introducing mandates that require a given percentage of transport fuels to be substituted

²²⁷ Since tax policy is not part of the sphere of action of the European Community, each EU member state decides on the level of taxation it considers appropriate for fossil and biofuels

with biofuels as a complementary form of support to tax exemptions, or as an alternative measure.

The Commission encourages their use with the expectation that in the long run, biofuel obligations will bring down the cost of promoting biofuels – in part because they ensure large scale deployment - and will prove the most effective approach.

As it is showed in Table 1.1, from a regional perspective the EU as a whole has not met its 2 percent (by energy content) consumption target by 2005, reaching a share of only 1.4 percent. The European Commission called for additional measures (among which a consideration whether targets for Member States should be made mandatory) to be taken if the higher target of 5.75 percent market share is to be reached by 2010.

Future steps and challenges with the aim of helping reaching the above percent target have been outlined in several documents as in the *Biofuel Strategy* and the *Report for the implementation of the Biofuels Directive* brought forward by the Commission in 2006, and based on the Member Countries progress reports. Following this *Progress Report* the EC has undertaken a review of Bio-fuels Directive²²⁸, currently ongoing. Some future challenges and way forwards contained in these documents are illustrated below:

- Set minimum biofuel targets for 2015 and 2020 in order to provide a long term enabling framework for investment in more efficient biofuel technologies;
- Amend the directive and set national target for the market share of biofuels and introduce biofuels obligations;
- Encourage the environmentally benign production of biofuels thorough a system of incentives/support or a certification system aimed to further increasing the GHG benefits of biofuel policy and minimize environmental and biodiversity risks (for example allowing only biofuels whose production in the EU and third countries complies with minimum sustainability standards – verified along the full production chain – to count towards the indicative targets set in the Directive);
- Promote a product mix that includes domestically produced biofuels as well as imports from a variety of regions. Consequently designing a policy so that both European producers and third countries benefit from the growing market for biofuels;
- Support the research into second-generation biofuels and bring them onto the market, so that an even wider range of feedstocks, and improved production methods can be used (including bio-refineries) and their cost competitiveness improved;
- Promote large-scale use of biofuels by improving their cost-competitiveness;
- Revise the European standard for blending of bioethanol and diesel (maximum level of 5 percent by volume) therefore removing the existing constraints on increasing the use of biofuels.

The debate surrounding EU bioenergy policies remains intense.

²²⁸ available at http://ec.europa.eu/agriculture/biomass/biofuel/index_en.htm

As the European Union moves forward to achieving its renewable energy and biofuels targets for 2020, and consumption of biomass thus increases, a policy framework that promotes the sustainable development of the bioenergy sector will become increasingly challenging.



1.4 Country Policy Table – European Union

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/Activity Target Area	Direct	Indirect
EC	Directive 2001/77/CE on the promotion of the electricity produced from renewable energy source in the internal electricity market (known as 'RES-E' Directive)	Legislation-targets	Yes	Electricity suppliers	It obliges Member States to establish national targets for future consumption of RES; it sets an EU-wide reference target of 22 percent of renewables share in electricity production by 2010.	
EC	Biomass Action Plan_COM(2005) 628 final	Activity-strategy	No	Industry-bioenergy producers	It sets out a coordinated programme for Community action, including measures to promote biomass use in heating, electricity and transport, followed by cross-cutting measures affecting biomass supply, financing and research. Main objectives of the Action plan is to double the 4 percent share of energy needs met by biomass by 2010. Measures will have to help the attainment of the targets indicated in the Directives 2001/77/CE and 2003/30/CE	
EC	Green Paper: towards a European Strategy for the security of energy supply	Activity-strategy	No	Industry-bioenergy producers-electricity supplier	It promotes all usage of biomass (electricity, heat and biofuel for transportation). It proposes a target of 20 percent share of diesel and petrol in the road transportation by 2020 suggesting for a proper framework of incentives to be set	
EC	Directive 2004/8/EC on the promotion of cogeneration	Policy (legislation)-incentives	Yes	Industry and domestic users	It aims to increase energy efficiency and improve security of supply by creating a framework for promotion and development of high efficiency cogeneration of heat and power (CHP) based on useful heat demand and primary energy savings in the internal energy market, taking into account the specific national circumstances especially concerning climatic and economic conditions.	
EC	Communication on renewal of district heating COM(2003) 397	Policy-incentives	Pending		Proposal to extend to district heating the reduced rate of VAT already applied to natural gas or electricity	
EC	Directive 2003/30/EC on the promotion of the use of biofuels and other renewable fuels for transport	Policy- targets		Producers/Suppliers (Transport) in EU MS	Sets a no mandatory target of 2 percent market share for biofuels in 2005 and 5.75 percent share in 2010. Some Member states have turned these targets into obligations requiring fuel supply companies to incorporate a given percentage of biofuels in the fuel they place on the market	

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
		Increased use of renewables from biomass in the generation of electricity		The Directive abstains from proposing a harmonized Community-wide support system. All member states have now published their national RES electricity targets, independently of the support system or scheme in force. The Directive obliges member states to: a) assure guaranteed access for RES-E; b) issue guarantees of origin of RES-E and c) assure that the calculation of costs for connecting new producers of RES-E should be transparent and non-discriminatory.
		Impact on bioenergy market development		The main objective of the Biomass Action Plan is to double the 4 percent share of EU energy needs met from biomass by 2010. The plan would reduce oil imports by 8 percent, prevent greenhouse gas emissions worth 209 million tons CO ₂ -equivalent per year and create up to 300,000 new jobs in the agricultural and forestry sector. It encourages Member States to establish national biomass action plans (nBAPs).
		Promotes development of biomass use		
	It supports electricity and heat production by biomass, through high efficiency micro, small scale and diffused cogeneration units	It supports the creation of a market for small/micro scale CHP individual boilers running on biomass		
		It promotes "the use of biofuels to replace diesel or petrol for transport purposes in each Member State, with a view to contributing to objectives such as meeting climate change commitments, environmentally friendly security of supply and promoting renewable energy sources". It puts blending targets on the end-use product		Although the targets are not mandatory EU members are required to annually submit reports describing the way they implement the objectives of the directive or how they plan to do so. A review of the Directive is on going. The Directive also focuses on the need to develop appropriate European Standards so that biofuels can be traded freely within the EU. A Biofuels progress report COM(2006) 845 has been elaborated underlying that the 2010 target is not likely to be achieved urging for more efficiency in biofuel policy and the need for setting out appropriate target of 10 percent in 2020 and promoting legally binding targets.

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/Activity Target Area	Direct	Indirect
EC	Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity (also known as Energy Taxation Directive)	Policy (legislation)-incentives	Yes	Producers/Suppliers (Transport) in EU MS	Facilitates member states to reach the targets indicated in the Directive 2003/30/EC allowing them to apply fuel tax exemptions (environmental state aids)	
EC	Proposal for a Directive on the support of clean vehicles by public procurement COM(2005)634	Policy (Legislation)-incentives	Pending	Industry		(Environment/transportation) Aimed to encourage public procurement of clean vehicles, which could include those using high biofuel blends
EC	COM(2006) 302 on a Forest Action Plan	Activity-incentives	No	Forest industry		Aimed to enhance sustainable forestry management and improve the competitiveness of the European forestry industry. It also proposes actions aimed at increasing the use of forest resources for energy production.
EC	Directive 2003/17/EC (known as EU fuel quality directive) amending directive 98/70/EC relating to the quality of petrol and diesel fuels	Legislation-target	Yes	Biofuels producers	It amends EU's environmental specifications for market fuels to establish specifications for petrol and diesel. The EC for standardization (CEN) sets limits on biofuel blending to no more than a 5 percent share by volume (or 4,6 percent in energy terms) for technical reasons	
	Reg. (CE) 1782/2003 (CAP reform)	Policy-incentives	Yes	Farmers		It allows energy crops to be produced on set-aside land. Incentives of 45euro/hectare can be granted for energy crops grown in traditional food crop areas (non set aside land)
EC	Renewable Energy Road map COM(2006)848	Activity-targets	No	Bioenergy and biofuels producers	Proposes a legally binding target to have 20 percent of the EU's overall energy consumption coming from renewables by 2020, and as part of the overall target, a binding minimum target for each member state to achieve at least 10 percent of their transport fuel consumption from biofuels. However, the binding character of this target is "subject to production being sustainable" and to "second-generation biofuels becoming commercially available". Includes a set of policies aimed to create incentives and support to the development and increased use of renewable energy technologies as well as eliminate any unnecessary legislative or regulatory barriers within the EU and its Member States.	

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
		Promotes the use of biofuels		The Commission authorization to the implementation of the state aids has the aim of avoiding undue distortions of competition and is based on the Community guidelines on state aid for environmental protection. To minimize the tax revenue loss for MS the final tax on biofuels intended for transport use may not be less than 50 percent of the normal excise duty.
		It would create a market for low emitting vehicles and therefore promoting the market introduction of biofuels		
It helps the development of markets for pellets and chips through information to forest owners about the opportunities of energy feedstock production and the facilitation of investigation and dissemination actions				
	It establishes limits on biofuels blending representing an obstacle to achieving the targets set in the Biofuels Directive. It is expected, therefore, that the Fuel Quality Directive will be revised.			
It can foster the availability of feedstock dedicated to biofuels production				Eligible area is limited to 1.5 (or 2?) million hectares, meaning that the expenditures under the energy crop scheme cannot be higher than €90 million. However agricultural raw material used for biofuel production also benefits from the support granted to traditional food crops (as compensatory payments given to oilseeds producers), the support is now given to the farmers in the form of market price support (single farm payment)
		Increased use of renewables from biomass in the overall energy consumptions and increased contribution of biofuels to the transport fuels consumption		Endorsed by the EU Summit of March 2007. Sector-specific targets are not set, so giving MS flexibility in promoting renewables according to their potential and priorities. Member States will be required to present National Action Plans and these should contain sectoral targets. A proposal on heating and cooling is lacking in this Roadmap

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/Activity Target Area	Direct	Indirect
Council of the European Union	EU strategic guidelines for rural development Council Decision for the period 2007-2013 (2006/144/EC)	Activity-incentives	No	Farmer and forest industry		Rural development- It allows support from EU for investment in bioenergy on or near farms (including capital costs for setting up biomass production)
EC	EU sugar reform (20/02/2006)	Policy-incentives	Yes	Farmers	It foresees a 36 percent cut in the internal sugar support price, the elimination of the intervention system of sugar purchase and partial sugar production quota buyback. Moreover it allows sugar beet production to qualify for both set-aside payments when grown as a non-food crop and for the energy crop aid of 45 €/ha on non-set aside area. Lastly sugar used for the production of bioethanol will be excluded from sugar production quotas.	
EC	VII Framework Programme	Activity-R&D	No	Industry, research centres in MS.	It co-ordinates, finances and organizes European research and development as well as facilitation of good practices.	
	Structural and cohesion Funds	Activity-Incentives	No	Farmers and producers in qualifying regions		Employment and Development. They can be used to support economic growth and employment creation or stabilization through bioenergy development. These funds can support the retraining of farmers, the provision of equipment for biomass producers, investments in facilities to produce biofuels and other materials, and fuel switching to biomass by electricity and district heat producers

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
See conversion	It foresees a Community farm investment aid to develop local infrastructure and human capital in rural areas aimed to support developing new outlets for agricultural and forestry products with a higher value added. It helps to modernize agricultural holdings including the introduction of new technologies for non-food sectors and energy crops and to enhance market opportunities in the renewable energy sector			
It could impact biofuel feedstock availability since the reforms substantially reduce internal sugar beet production incentives.				For Member States which cut the quota more than 50 percent the EU provides further traditional coupled aids with the aim of giving to the farmers who continue the beet cultivation the time of improving their competitiveness.
	It encourages the market to find and develop new technologies, including the use of by-products and potential feedstocks now classified as waste. It includes several actions with a biomass component: biomass for fuels, electricity heating and cooling, smart energy network including integration of biomass installations into electricity grids and feeding biogas into the natural gas grid. Among the areas supported by the Programme: the development of an industry-led biofuel technology platform, the bio-refinery concept, research into second-generation biofuels. Through the Intelligent Energy for Europe Programme the EC supports the dissemination of techniques that have been proven through research.			
	Provides funding for the development of bioenergy facilities in qualifying regions. Most Structural Fund assistance is granted in the form of non-repayable grants or "direct aid", and to a lesser degree refundable aid, interest-rate subsidies, guarantees, equity participation, and participation in venture capital. The contribution from the funds depends on eligibility under the Objectives and the economic and geographical situation of the various regions.			

Implementing Agency	Policy/Activity Name	Legal and Regulatory Instruments			Impact on Bioenergy	
		Policy/Activity Type	Existing Legislation	Policy/Activity Target Area	Direct	Indirect
	Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community.	Policy-targets	Yes	Industries in the EU MS		Climate change/Environment- It enables companies exceeding individual CO2 emissions targets to buy allowances from 'greener' ones and help reach the EU targets under the Kyoto Protocol. The EU Directive provides penalties for emissions in excess of surrendered allowances of €40/ton CO2 in the first period, and €100/ton CO2 in the second period.
	Kyoto Protocol to the UNFCCC (1998)	Policy-target	Yes	Member States		Climate Change - For the Protocol signatory countries, the abatement targets require a total cut in greenhouse-gas emissions of at least 5 percent from 1990 levels in the commitment period 2008-12. Through a new Communication ("Limiting Global Climate Change to 2 degrees Celsius. The way ahead for 2020 and beyond"- COM(2007) 2 final) the Commission proposed to reduce GHG emissions unilaterally by 20 percent by 2020
	European Technology Platform for Biofuels	Activity- R&D	No	Biofuels industry-research communities	The main objective of this activity is to overcome both the technical and non-technical barriers to biofuel use, both in the European Union and worldwide. providing guidance on and promotion of relevant Research, Development and Demonstration (RD&D).	
EC	Proposal for a Directive on the promotion of clean road transport vehicles COM(2005) 634	Policy	No	Vehicles producers		(Transportation/Environment) It proposes that public bodies (State, regional or local authorities, bodies governed by public law, public undertakings and operators contracted by public bodies to supply transport services) will be obliged to allocate a minimum quota of 25 percent of their annual procurement (purchasing or leasing) of heavy-duty vehicles (with a weight greater than 3.5 tonnes) to "enhanced environmentally friendly vehicles" as defined in the European Performance Standard (EEV), as defined in Directive 2005/55/EC.
	EU Strategy for Biofuels- COM(2006) 34 final	Activity-incentives	No		It includes seven policy axes: Stimulating demand for biofuels; Capturing environmental benefits; Developing the production and distribution of biofuels; Expanding feedstock supplies; Enhancing trade opportunities; Supporting developing countries; Supporting research and development. It proposes biofuels obligations as a promising way of overcoming difficulties with tax exemptions	

For the purposes of this table:

"Policy" is considered to be law created through interpretation and regulatory guidelines put forth by the implementing agency(ies). "Policy Type" is considered to identify the type of law and the goals of the mandate. "Activity Type" is defined in two categories: International (binding or non-binding - bilateral or multilateral) agreements and collaborations, or non-binding/voluntary recommendations/programmes that advance the implementation of bioenergy, biofuels, and renewable energy into the energy stream. "Legislation" is defined as national or state (sub-national political boundaries) legislative mandates. "Target Area" is defined as the sector on which the policy's/activity's goals and objectives are focused - the area of most direct impact and engagement. (e.g industry, bioenergy producers, bioenergy suppliers, farmers, educational institutions).

Impact on Production Stream			Funding Mechanism	Comments
Production	Conversion	Use		
		It establishes a credit market trading system promoting an increase in the use of biomass and energy crops in the generation of electricity		
		It promotes bioenergy projects reducing GHGs also through the use of CDM mechanism		
	Contributes to the development of cost-competitive world-class biofuels technologies	Accelerates the deployment of biofuels in the European Union		
		It can contribute towards the creation of a market for "clean" vehicles, by providing manufacturers the assurances they need in order to develop these vehicles for a wider market		The Commission will examine whether, in a second stage, the quota obligation should be extended to include other vehicle categories.
It provides an overall strategy for a sustainable production and use of biofuels, exploring opportunities for developing countries, recommending a regulated market-based approach for biofuels deployment.	See impact on production	See impact on production		The EU Strategy for Biofuels states that the EU will pursue a "balanced approach in ongoing and future trade negotiations" and will "respect the interests of both domestic producers and EU trading partners". It also gives a commitment that "market access conditions" for imported bioethanol will be "no less favourable" than under current trade agreements. The Strategy insists that biofuels production in the developing world must be done in a way which is positive for the environment and which supports sustainable development for both feedstock and biofuels. One of the issues which the European Commission will consider in its review of the Biofuels Directive is whether only biofuels meeting minimum carbon emissions should qualify for the indicative targets.

provision); electricity generation from biomass (including market penetration targets, target flexibility, enforcement provision, and heat generation from biomass including targets, target flexibility, enforcement provision). "Indirect" is defined as policies or activities that impact the energy sector by influencing activities in other sectors - affecting bioenergy deployment both directly and indirectly. Policies and activities from the following sectors should be considered: agriculture/land use, environment, trade/industry, forestry, waste management, poverty reduction, rural development, and employment.

2 NAFTA²²⁹

NAFTA is the North American Free Trade Agreement between the United States, Canada and Mexico. It came into effect on January 1, 1994. The purpose of NAFTA is to encourage trade by eliminating tariffs on most goods originating in and traded between these countries over a fifteen-year period.

Under NAFTA, all non-tariff barriers to agricultural trade between the United States and Mexico were eliminated. In addition, many tariffs were eliminated immediately with others being phased out over 5 to 15 years. All agricultural provisions will be implemented by the year 2008. For import-sensitive industries, long transition periods and special safeguards were created to allow for an orderly adjustment to free trade.

The agricultural provisions of the United States-Canada Free Trade Agreement (FTA), in effect since 1989, were incorporated into the NAFTA. Under these provisions, all tariffs affecting agricultural trade between the United States and Canada, with a few exceptions for items covered by tariff-rate quotas (TRQs²³⁰), were removed before January 1, 1998.

Mexico and Canada reached a separate bilateral NAFTA agreement on market access for agricultural products. The Mexican-Canadian agreement eliminated most tariffs either immediately or over 5, 10, or 15 years. Tariffs between the two countries affecting trade in dairy, poultry, eggs, and sugar are maintained.

²²⁹ Available at <http://www.fas.usda.gov/info/factsheets/NAFTA.asp> --> Factsheet;
<http://www.ers.usda.gov/Briefing/NAFTA/> → Recent developments, data products

²³⁰ A tariff-rate quota (TRQ) is a two-level tariff where a limited volume of imports are allowed at the lower tariff and all subsequent imports are charged the higher tariff

3 APEC²³¹

The Asia-Pacific Economic Cooperation (APEC) member economies include more than one third of the world's population (2.6 billion people), almost 60 percent of the global GDP and 47 percent of the world trade volume and account for 70 percent of global economic growth. The APEC member countries are Australia, Brunei, Canada, Chile, China, Hong Kong, Indonesia, Japan, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, Philippines, Russia, Singapore, South Korea, Taiwan, Thailand, United States and Vietnam.

APEC was conceptualized informally in 1989, among ministers of 12 participating states at a meeting in Canberra, Australia. APEC leaders met formally for the first time in 1993 to outline APEC's vision of trade stability, security and regional economic development.

The key objectives that drive APEC concern trade liberalization among member nations and regional economic growth. APEC is also involved in discussing solutions to reducing business transaction costs. Recently, however, APEC has also begun to address security-related issues such as controlling avian flu and other pandemics and exploring regional counter-terrorism initiatives to combat arms trade.

Although APEC has not yet adopted any definitive measures toward promoting bioenergy usage in the region, the organization is currently directing numerous project-based efforts to study, understand, and take advantage of regional potentials for sustainable transport sector biofuel usage, in particular toward the goal of energy security. A few of their relevant activities are outlined below.

3.1 Instructions from APEC Energy Ministers

As one of eleven implementing APEC divisions, the Energy Working Group (EWG) directs the "Task Force on Biofuels," which aims to enhance members' understanding of the potential for biofuels to replace oil in the transport sector. The Task Force reported recent findings at the 8th APEC Energy Ministers Meeting in May 2007. Subsequent instructions then appeared in the 27 May 2007 "Darwin Declaration On: Achieving Energy Security and Sustainable Development through Efficiency, Conservation and Diversity."²³² In a section treating energy security and transport efficiency, the Ministers state that "biofuels production should be advanced in line with sustainable development objectives" and encourage technological advancements toward the use of "non-food feedstocks". Without mention of bioenergy specifically, the Ministers encourage APEC members to "diversify the fuel mix" with cleaner fuels in order to manage oil dependency. A directive was given for the EWG to "develop best practice principles for energy efficient transport" and in addition encouragement was given of joint-EWG work with other international organizations engaged in alternative fuel policy, such as the IEA and GBEP.

²³¹ Available at <http://www.apec.org/> → History, recent news, official website.

²³² Available at www.industry.gov.au/assets/documents/itrinternet/EMM8_Declaration_Final20070529183150.pdf

3.2 EWG Projects

There are several EWG sponsored programs currently in progress. A survey and report entitled “*Biomass Resource Assessments and Assessment Capabilities in APEC Economies*” will focus efforts in particular on understanding the potential for wastes and agricultural products to contribute to transport biofuel use in APEC economies in order to limit oil dependency. The project is expected to be completed by 31 December 2007.

3.3 Expert Group on New and Renewable Technologies Projects

Five Expert Groups assist the EWG, including the “Expert Group on New and Renewable Energy Technologies” (EGNRET), which was created to promote and facilitate the use of “new and renewable energy” where cost effective. EGNRET efforts are administered through the “APEC 21st Century Renewable Energy Development Initiative” and include two current projects which are intended to establish guidelines related to biofuels.

Of special interest is a project aimed toward the “*Establishment of the Guidelines for the Development of Biodiesel Standards in the APEC Region*” proposed by Thailand and co-sponsored by four other member economies. The motivating assumption underlying this report is that existing European and American biodiesel standards are incompatible with the feedstocks used in the APEC region. To bridge this gap, the project is made up of several components, including an examination of the biodiesel lifecycle from automotive and emissions perspectives, as well as a review of existing biodiesel standards and current feedstocks. The report will also incorporate feedback resulting from discussions with stakeholders, in particular from automobile manufacturers, on barriers and opportunities related to biodiesel, and also from APEC energy sector representatives on desired parameters for biodiesel specification. The Biodiesel Standards project is expected to finish on 31 October 2008.

Another EGNRET project, entitled “*Alternative Transport Fuels-Implementation Guidelines*” will produce database resources and an analytical report, and also host a workshop in order to help governments implement successful and regionally coherent alternative transport fuels programs. This project will be completed by 31 December 2008.

4 ASEAN

The Association of Southeast Asian Nations or ASEAN was created in August 1967 by representatives of Indonesia, Malaysia, Philippines, Singapore and Thailand. Over the next three decades these five original members were joined by Brunei Darussalam, Vietnam, Laos, Myanmar and Cambodia. These nations have a combined population of about half a billion, total area of 4.5 million square kilometers, a total GDP of close to US\$ 700 billion, and the total value of ASEAN trade amounts to US\$800 billion making it the third largest trading block in the world.

ASEAN was created to enhance regional economic growth, social progress and cultural development. Additionally, the aim was to promote peace and stability in the region by fostering a cooperative adherence to the principles of the UN Charter.

ASEAN leaders adopted the ASEAN Vision 2020 on the organization's 30th anniversary. The goal was to agree on a shared, cooperative development among South-East Asian nations that promotes regional peace, stability and prosperity. Building from Vision 2020, the ASEAN leaders resolved in 2003 to establish three ASEAN Communities focused on regional security, economic development and socio-cultural enhancement.

In January of 2007, ASEAN and its six regional partners, including China and India signed the Cebu Declaration on East Asian Energy Security. The declaration is “meant to demonstrate their determination to curb GHG emissions and boost energy safety and efficiency in the Asia-Pacific region” as well as reduce dependence on imported oil. Among other things, the agreement acknowledges “the need to strengthen renewable energy development such as in biofuels, and to promote open trade, facilitation and cooperation in the sector and related industries”²³³ and calls for the creation of “a common standard for the use of biofuels in engines and motor vehicles”.²³⁴

²³³ Cebu Declaration on East Asian Energy Security. Cebu, Philippines, 15 January 2007 (available at <http://www.aseansec.org/19319.htm>. Accessed in October 2007)

²³⁴ Wang Yu “Southeast Asian nations reach energy agreement”, Science and Development Network. 16 January 2007

5 MERCOSUR

The Southern Common Market (MERCOSUR) was formed in March 1991 by Argentina, Brazil, Paraguay and Uruguay upon signing the Treaty of Asuncion. Formed as a trade bloc, the purpose of MERCOSUR is to allow for free trade between member countries with the eventual goal being the economic integration of all of South America. The total population of MERCOSUR nations is more than 250 million people with the members contributing to a collective output of \$1.1 trillion. Among them, Brazil has by far the largest economy with a GDP of nearly \$800 billion. MERCOSUR is presently the world's fourth largest trading bloc, after the EU, NAFTA and ASEAN.

Current full members of MERCOSUR include Argentina, Brazil, Paraguay, Uruguay and Venezuela. Associate members include Chile, Bolivia, Colombia, Ecuador and Peru who do not enjoy full voting rights or full access to the markets of the full members. The objectives of MERCOSUR as outlined by the International Labour Organization (ILO) are:²³⁵

- Free transit of production goods, services and factors between the member states with inter alia, the elimination of customs rights and lifting of nontariff restrictions on the transit of goods or any other measures with similar effects;
- Fixing of a common external tariff (TEC) and adopting of a common trade policy with regard to nonmember states or groups of states, and the coordination of positions in regional and international commercial and economic meetings;
- Coordination of macroeconomic and sectorial policies of member states relating to foreign trade, agriculture, industry, taxes, monetary system, exchange and capital, services, customs, transport and communications, and any others they may agree on, in order to ensure free competition between member states; and

In 2006 MERCOSUR signed a Memorandum of Understanding which created a special working group on biofuels was created to:

- Stimulate the production and consumption of biofuels, in particular ethanol and biodiesel;
- Conduct a comparative assessment of the regulatory frameworks for biofuels within MERCOSUR;
- Stimulate the structuring of integrated biofuels production chains in MERCOSUR;
- Stimulate technical cooperation regarding biofuels, especially ethanol and biodiesel, among public and private entities within MERCOSUR;
- Stimulate research programs regarding the production and use of biofuels within MERCOSUR taking existing programs into consideration;
- Facilitate the interchange of information with respect to technical aspects and technologies related to the production and use of biofuels; and

²³⁵ available at <http://www.itcilo.it/actrav/actrav-english/telearn/global/ilo/blokit/mercosur.htm>

- Promote capacity building for the sustainable production of biofuels, including the evaluation of the environmental impact, land use, use of residuals, elimination and recycling of residues, distribution infrastructure, logistics, among other aspects.²³⁶

²³⁶ “Memorandum de entendimiento para establecer un grupo de trabajo especial sobre biocombustibles.” Mercosur/ lxvi gmc/p. Dec. N° 32/06

6 CBI – Caribbean Basin Initiative

Not an explicit trade agreement, the Caribbean Basin Initiative (CBI) is a comprehensive program aimed at promoting economic development through private investments in Central American and Caribbean Countries. A main objective of the CBI is to increase the investment by both foreign and domestic financiers, in non-traditional sectors of trade in CBI countries thereby diversifying their economies and enhancing their exports. The CBI is collectively formed by the Caribbean Basin Economic Recovery Act of 1983 (CBERA) which was amended in 1983, and the Caribbean Basin Trade Partnership Act of 2000 (CBTPA). Jointly, these facilitate the duty-free export of a range of products from CBI countries to the United States. A recent refinement of CBI legislation known as the CBTPA, is set to provide CBI countries specific trade allowances with the United States, akin to the arrangement with Mexico under the North American Free Trade Agreement (NAFTA).

The CBI beneficiaries include the Central American nations of Belize, Costa Rica, El Salvador, Guatemala, Guyana, Honduras, Nicaragua and Panama and the Caribbean nations of Antigua, Aruba, the Bahamas, Barbados, British Virgin Islands, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Montserrat, Netherlands Antilles, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, and Trinidad and Tobago.

There are bioethanol provisions in the CBI permit up to 7 percent of the United States bioethanol production to be derived duty-free from a foreign feedstock if it is produced in any of the CBI nations. Additional to the 7 percent import allowance, CAFTA allows for 35 million gallons (132.5 million litres) of bioethanol to be imported duty-free into the United States provided that at least 30 percent of that bioethanol is derived from a local or Caribbean region. Above the 35 million gallons, imports are duty-free if at least 50 percent of the bioethanol is extracted from feedstocks of the Caribbean Basin.

7 CAFTA

Certain countries of the CBI were also involved in the creation of the Central American Free Trade Agreement (CAFTA) in early 2004. This trade agreement formed between the United States and the nations of Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua came to be known as CAFTA-DR upon the inclusion of the Dominican Republic in August 2004. CAFTA-DR is the second largest free-trade zone in Latin America for United States exports that eliminated 80 percent of tariffs with the remaining tariffs being scheduled to be phased out over the next 10 years. With the formation of CAFTA, the CBI, and its bioenergy-related provisions, becomes a permanent part of regional trade policy.

7.1 Generalized System of Preferences (GSP)

The GSP is a system of preferential tariffs that favor developing countries. Until December 2005, the European Union GSP that was in effect, categorized bioethanol (code 22 07) as a sensitive product, all imports of which qualified for a 15 percent cut of the duty as per the Most Favored Nation (MFN) agreement of the WTO. The most recent EU GSP, known as the GSP+, has put in place a special incentive scheme that supports sustainable development and sound governance by granting unlimited, duty free access to bioethanol imports from Bolivia, Colombia, Costa Rica, Ecuador, Panama, Peru, El Salvador, Venezuela, Georgia, Sri Lanka and Mongolia. Pakistan, which used to qualify for reduced tariffs under the original GSP, is no longer a beneficiary since total EU imports of Pakistani bioethanol are over 1 percent and thereby, subject to full MFN imports.

This provides an interesting example of the impact these provisions can have on nations' industries. Resulting from the revocation from the GSP status, two of the seven operating distilleries in Pakistan shut down while, due to uncertain markets, another five new distilleries are likely to cancel their plans to start operation.

ANNEX III – Bioenergy Information: Data Sources, Terms and Conversion Factors

The production and consumption of biofuels are either deeply rooted, and (largely) informal, or of very recent development due to the powerful momentum created by policies and markets in recent years. In addition, unlike other fuels and energy forms that are firmly and traditionally placed within the energy sector, biofuels are at the crossing of energy, forestry and agricultural sectors and, most relevant for the quality and quantity of information available, until recently biomass fuels were regarded as marginal products in all sectors (FAO 2005).

These factors strongly affect the availability of complete and up-to-date information. Hence no source of information can be considered as fully authoritative and the reader should look at the statistics presented as best approximations rather than true representations.

The sources of information of the country tables and graphs presented below are the International Energy Agency (IEA), which maintains the most complete and consistent information system on energy matters, and the FAO, which maintains the most complete database of forest products (including woodfuels) and agriculture (including potential biomass feedstocks).

Several other data sources were consulted and compared to the main IEA reference. It was not always possible to determine the reliability of individual sources due to the widespread habit of non-reporting original data sources and assessment methods. Hence these alternative sources were simply compared to IEA data. Without implying any judgment on these sources, mention is made below only of sources that differ significantly from IEA data and that may provide more complete and up-to-date information.

Terms and definitions are extremely important when compiling and comparing data from different sources. Unfortunately, in this “new” thematic context, terms are often used inconsistently, sometimes using data from other sources and changing the definitions, which generates confusion and misunderstanding.

In this Annex the terms applied are those of the data sources and their definitions are provided at the end of the Annex. For all other terms, reference is made to the Unified Bioenergy Terminology (FAO, 2003), an abstract of which is also presented in form of glossary for the most relevant terms.

1 Data sources and estimation processes

1.1 IEA-based statistics

The values presented in Section 2.6 and in Annex I are extracted from the following IEA databases:

- World, renewables balance (Ktoe)
- World, renewables supply and consumption (various units)

The biofuels categories covered are listed in the Table 2.1, along with IEA definitions and some comments.

All values were converted in Petajoules [PJ] and the applied conversion factors are reported in Table 2.6.

1.2 FAO-based statistics

Original FAO data on forest products (FaoSTAT) was used to estimate/update woodfuel statistics (fuelwood, charcoal, black liquor), following the estimation procedure applied in i-WESTAT (FAO 2005).

Considering formal IEA and FAO definitions, woodfuels represent a portion of the IEA Primary Solid Biomass, which includes all woodfuels as well as agricultural and livestock residues used as fuel. In most countries woodfuels represent the quasi-totality of Primary Solid Biomass. A direct comparison with IEA Solid Biomass data, which includes also crop/livestock residues used as fuel, cannot be made. In addition, it's important to highlight that the two databases have different sources, energy agencies for IEA and forestry agencies for FAO, which explain in part the discrepancies between the two.

In the country tables and graphs the FAO-based woodfuel values and IEA Primary Solid Biomass values are combined for easy comparison. Where the match is reasonable, woodfuel data provide an additional insight on aggregated solid biomass statistics. In several cases, however, the datasets are obviously inconsistent: where woodfuels values are higher than solid biomass (Italy, Japan, Russia), or where they are far lower (France, Germany, United Kingdom), highlighting the need to harmonize data collection and estimation procedures between forestry and energy sectors.

1.3 Other sources

EuObserv'ER data reported in the issues of Barometer

The term “wood energy” as used in the Wood energy Barometer 2005 report also includes crop harvest residues, therefore corresponding to IEA primary solid biomass. Both values are very close. (The inconsistent definition was acknowledged in the next issue of Barometer).

Solid biomass Barometer, December 2006 gave statistics for 2004 and 2005. Production values reported were close to IEA data, for France and Germany but significantly less for Italy (quite unjustified since IEA is most likely underestimating woodfuels consumption), and slightly higher for United Kingdom. The report provides information for France and United Kingdom on the breakdown of solid biomass into main wood and agricultural residue components. Data on bioenergy electricity production are similar to IEA's for CHP plants but differ for electricity only plants (possibly including some electricity produced with gas originating from biomass). No information provided on estimation sources/methods.

Liquid biofuels Barometer 2007. Consumption in 2005 and 2006 are sometimes similar to the IEA's but differ at other times.

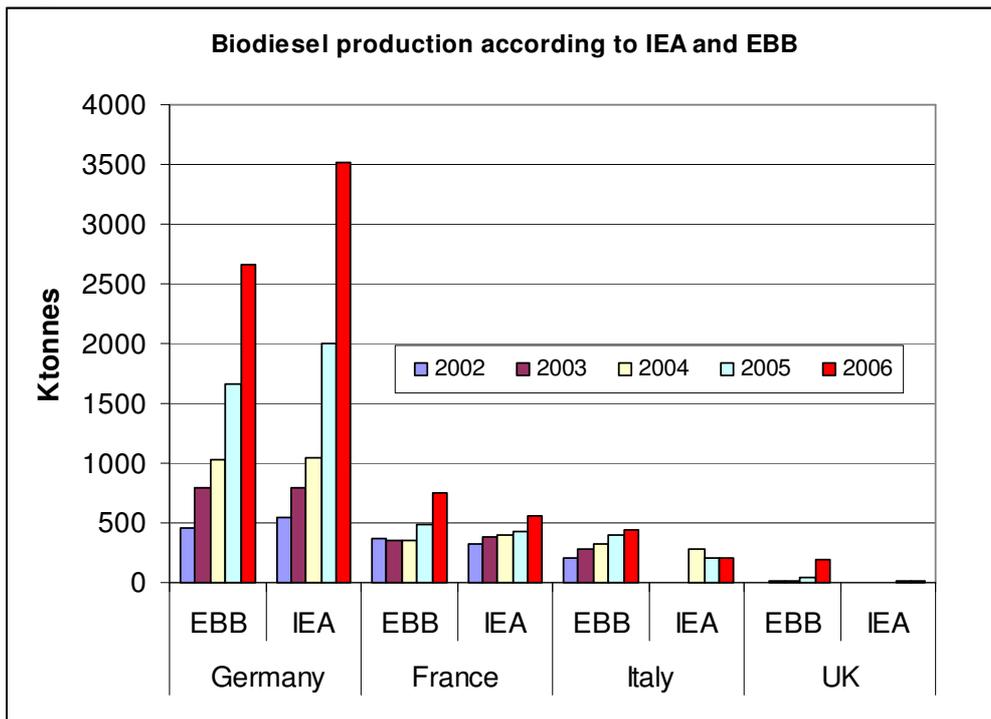
It is recommended to look more closely to the sources and estimation processes used by EurObserv'ER (and by Enerdata, a partner of IEA, providing a main source of energy data). However, the differences between datasets does not justify replacing IEA values with EurObserv'ER values. Moreover, IEA data are more consistently defined and cover all countries over several years rather than just European countries for 2004-2006.

It is difficult to judge on the reliability of data since no information is usually provided on estimation sources/methods.

European Biodiesel Board (EBB)

The European Biodiesel Board (EBB) publishes biodiesel production (and capacities) for European countries. Estimates for Italy and United Kingdom that are significantly different from IEA's. The source and estimation methods are not described.

Figure 1.1

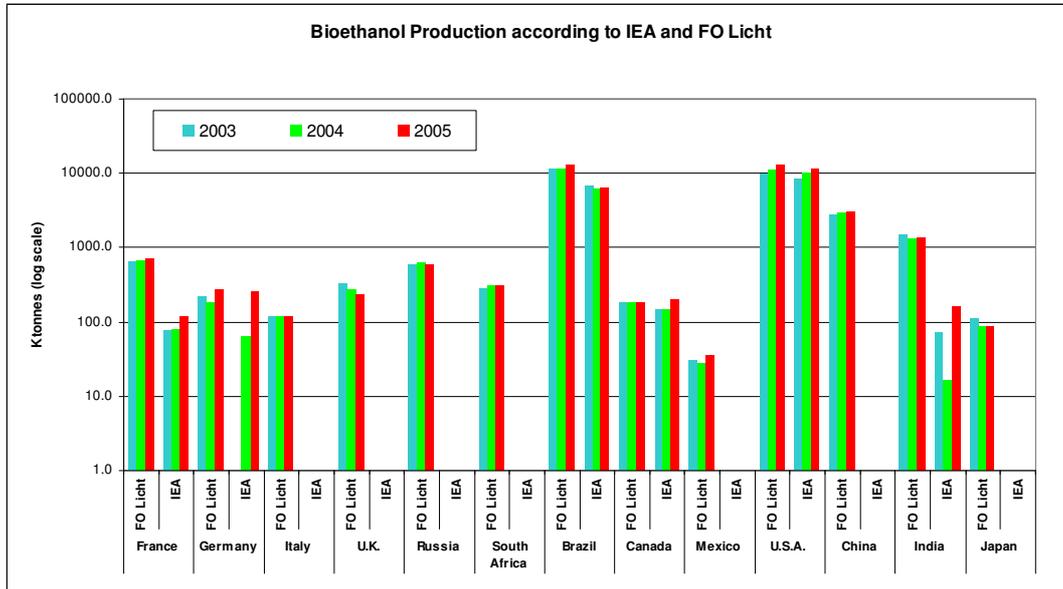


Renewable Fuels Association (RFA)

RFA uses FO Licht data for bioethanol and a comparison with IEA data shows there is a reasonable match for big producers (USA and Brazil) but a very strong IEA under-estimation for most other countries. For several countries IEA reports no production at all whereas FO Licht indicates sizeable production levels, as shown in Figure 1.2.

Although the FO Licht assessment method is not described it seems that its data are more reliable and complete than IEA's.

Figure 1.2 - Bioethanol production in G8 +5 Countries according to IEA and FO Licht



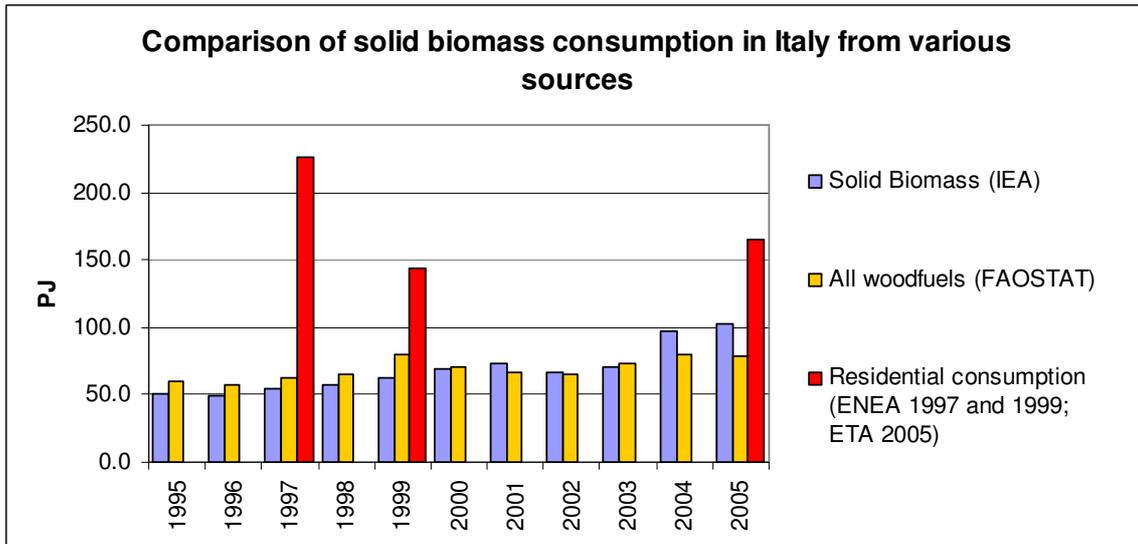
Other national sources

Given the limitations of international statistics described in the introduction, original national sources can be very important and indeed revealing. Italy, in this respect represents a clear case.

The estimated consumption of solid biomass in the Italian residential sector reported by ENEA for 1997 and 1999 (Gerardi et al. 1998; Gerardi and Perella, 2001) and by ETA are far higher than from IEA energy statistics (based on energy sector data) and from FAO Forestry statistics (based on forestry sector data). This is due to the absence of systematic data collection specifically dedicated to biomass in both sectors, which leads to a significant underestimation of actual consumption (and production) levels. It appears that the likely consumption of solid biomass (mainly fuelwood) in the residential sector alone is between 2 to 3 times higher than that reported by IEA or that may be deduced from FAO Forestry statistics for all sectors (Figure 1.3).

It is not easy to convert isolated point-data into coherent time series and to insert them in the energy database but they are very useful in revealing possible biases of international statistics and thus recalling us that no source should be given total confidence. Most important, these discrepancies highlight and emphasize the need for better focused and comprehensive data collection efforts if a realistic vision of the bioenergy sector is sought.

Figure 1.3 - Solid biomass consumption in Italy according to various national and international sources.



2 Glossary: terms and conversion factors

2.1 Key definitions

Primary energy: Primary energy is energy contained in raw fuels and any other forms of energy received by a system as input to the system. The concept is used especially in energy statistics in the course of compilation of energy balances²³⁷.

Conversion to secondary energy: Primary energies are transformed in energy conversion processes to more convenient forms of energy, such as electrical energy and cleaner fuels. In energy statistics these forms are called secondary energy²³⁸.

²³⁷ Source Wikipedia – www.wikipedia.org

²³⁸ Ibid.

2.2 IEA terms and definitions used in renewable energy statistics²³⁹

Table 2.1 - IEA biofuel categories and definitions

IEA Product	IEA Product definition	Comments
Primary Biofuels	Primary biofuel is defined as any organic matter used directly as fuel. This covers a multitude of woody materials generated by industrial process or provided directly by forestry and agriculture (firewood, wood chips, bark, sawdust, shavings, chips, sulphite lyes also known as black liquor, animal materials/wastes and other solid biomass). Charcoal is included here.	The flow of these biofuels is still mostly informal and poorly estimated. In many countries they are probably underestimated. Woodfuels are included here along with agro/livestock residues. For comparison and complement, country data present also FAO-based woodfuel estimates.
Biogas	Biogas is a secondary biofuel. It is derived principally from the anaerobic fermentation of biomass and solid wastes and combusted to produce heat and/or power. Included in this category are landfill gas, sludge gas and other biogas such as biogas produced from the anaerobic fermentation of animal slurries and of wastes in abattoirs, breweries and other agro-food industries.	Relatively recent and technologically specific, the statistics are probably of good standard.
Biogasoline	Biogasoline is a secondary biofuels. It includes bioethanol (ethanol produced from biomass and/or the biodegradable fraction of waste), biomethanol (methanol produced from biomass and/or the biodegradable fraction of waste), bioETBE (ethyl-tertio-butyl-ether produced on the basis of bioethanol; the percentage by volume of bioETBE that is calculated as biofuel is 47%) and bioMTBE (methyl-tertio-butyl-ether produced on the basis of biomethanol: the percentage by volume of bioMTBE that is calculated as biofuel is 36%). Biogasoline includes the amounts that are blended into the gasoline - it does not include the total volume of gasoline into which the biogasoline is blended.	IEA values show a reasonable match with other sources (i.e. FO Licht) for big producers (USA and Brazil) but a strong underestimation for most other countries. For several countries IEA reports no production at all while FO Licht indicates sizeable production levels.
Biodiesels	Biodiesels is a secondary biofuels. It includes biodiesel (a methyl-ester produced from vegetable or animal oil, of diesel quality), biodimethylether (dimethylether produced from biomass), Fischer Tropsh (Fischer Tropsh produced from biomass), cold pressed bio-oil (oil produced from oil seed through mechanical processing only) and all other liquid biofuels which are added to, blended with or used straight as transport diesel. Biodiesels includes the amounts that are blended into the diesel - it does not include the total volume of diesel into which the biodiesel is blended.	IEA values show a reasonable match with other sources (i.e. European Biodiesel Board) for big producers (Germany, France) but a certain underestimation for other countries. This also is a biofuel category in rapid development for which data collection procedures must be enhanced.

²³⁹ List limited to the items relevant to the present report and tables

IEA Product	IEA Product definition	Comments
Other Biofuels	Other biofuels includes liquid and gaseous biofuels used directly as fuel other than biogas, biogasoline or biodiesels, such as pyrolytic oils.	This IEA category needs a more complete definition. (IEA's conversion factors for this biofuels is close to Biogasoline).

Table 2.2 - Supply

Flow	Definition
Production	Production is the energy contained in primary biofuels. Production is calculated after removal of impurities (e.g. sulphur from natural gas).
Imports	Comprise amounts having crossed the national territorial boundaries of the country whether or not customs clearance has taken place.
Exports	Comprise amounts having crossed the national territorial boundaries of the country whether or not customs clearance has taken place.
Total Primary Energy Supply	Total primary energy supply (TPES) is made up of production + imports – exports – international marine bunkers ± stock changes.
Transfers	Comprises interproduct transfers, products transferred and recycled products.
Statistical Differences	Includes the sum of the unexplained statistical differences for individual fuels, as they appear in the basic energy statistics. It also includes the statistical differences that arise because of the variety of conversion factors in the coal and oil columns.

Table 2.3 - Transformation Sector

Flow	Definition
Transformation Sector	The transformation sector comprises the conversion of primary forms of energy to secondary and further transformation (e.g. coking coal to coke, crude oil to petroleum products, and heavy fuel oil to electricity). Inputs to transformation processes are shown as negative numbers and output from the process is shown as a positive number. Transformation losses will appear in the "total" column as negative numbers.
Main Activity Producer Electricity Plants	Refers to plants which are designed to produce electricity only. If one or more units of the plant is a CHP unit (and the inputs and outputs can not be distinguished on a unit basis) then the whole plant is designated as a CHP plant. Main activity producers (formerly referred to as public supply undertakings) generate electricity for sale to third parties, as their primary activity. They may be privately or publicly owned. Note that the sale need not take place through the public grid.
Autoproducer Electricity Plants	Refers to plants which are designed to produce electricity only. If one or more units of the plant is a CHP unit (and the inputs and outputs can not be distinguished on a unit basis) then the whole plant is designated as a CHP plant. Autoproducer undertakings generate electricity wholly or partly for their own use as an activity which supports their primary activity. They may be privately or publicly owned.
Main Activity Producer CHP Plants	Refers to plants which are designed to produce both heat and electricity (sometimes referred to as co-generation power stations). If possible, fuel inputs and electricity/heat outputs are on a unit basis rather than on a plant basis. However, if data are not available on a unit basis, the convention for

	defining a CHP plant noted above should be adopted. Main activity producers (formerly referred to as public supply undertakings) generate electricity and/or heat for sale to third parties, as their primary activity. They may be privately or publicly owned. Note that the sale need not take place through the public grid.
Autoproducer CHP Plants	Refers to plants which are designed to produce both heat and electricity (sometimes referred to as co-generation power stations). If possible, fuel inputs and electricity/heat outputs are on a unit basis rather than on a plant basis. However, if data are not available on a unit basis, the convention for defining a CHP plant noted above should be adopted. Note that for autoproducer CHP plants, all fuel inputs to electricity production are taken into account, while only the part of fuel inputs to heat sold is shown. Fuel inputs for the production of heat consumed within the autoproducer's establishment are not included here but are included with figures for the final consumption of fuels in the appropriate consuming sector. Autoproducer undertakings generate electricity and/or heat, wholly or partly for their own use as an activity which supports their primary activity. They may be privately or publicly owned.
Main Activity Producer Heat Plants	Refers to plants (including heat pumps and electric boilers) designed to produce heat only and who sell heat to a third party (e.g. residential, commercial or industrial consumers) under the provisions of a contract. Main activity producers (formerly referred to as public supply undertakings) generate heat for sale to third parties, as their primary activity. They may be privately or publicly owned. Note that the sale need not take place through the public grid.
Autoproducer Heat Plants	Refers to plants (including heat pumps and electric boilers) designed to produce heat only and who sell heat to a third party (e.g. residential, commercial or industrial consumers) under the provisions of a contract. Autoproducer undertakings generate heat, wholly or partly for their own use as an activity which supports their primary activity. They may be privately or publicly owned.
Heat Pumps	Includes heat produced by heat pumps in the transformation sector. Heat pumps that are operated within the residential sector where the heat is not sold are not considered a transformation process and are not included here – the electricity consumption would appear as residential use.

Table 2.4 - Final Consumption

Flow	Definition
Total Final Consumption	Equal to the sum of the consumption in the end-use sectors. Energy used for transformation and for own use of the energy producing industries is excluded. Final consumption reflects for the most part deliveries to consumers (see note on stock changes).
Industry Sector	Consumption of the industry sector is specified in the following sub-sectors (energy used for transport by industry is not included here but is reported under transport).
Transport Sector	Consumption in the transport sector covers all transport activity (in mobile engines) regardless of the economic sector to which it is contributing [ISIC Divisions 60, 61 and 62], and is divided into the following sub-sectors.
Other Sectors	Includes residential, commercial/public services, agriculture/ forestry, fishing and non-specified (other).
Residential	Includes consumption by households, excluding fuels used for transport. Includes households with employed persons [ISIC Division 95] which is a small part of total residential consumption.

2.3 Selection of most relevant terms from the Unified Bioenergy Terminology (FAO, 2005)

Table 2.5 FAO Terminology

Bioenergy	Energy from biofuels
Biofuel	Fuel produced directly or indirectly from biomass
Biomass	Material of biological origin excluding material embedded in geological formations and transformed to fossil
Black liquor	Alkaline spent liquor obtained from digesters in the production of sulphate or soda pulp during the process of paper production, in which the energy content is mainly originating from the content of lignin removed from the wood in the pulping process
Densified biofuel, compressed biofuel	Solid biofuel made by mechanically compressing biomass to increase its density and to mould the fuel into a specific size and shape such as cubes, pressed logs, biofuel pellets or biofuel briquettes
Energy crops, fuel crops	Woody or herbaceous crops grown specifically for their fuel value
Fuel	Energy carrier intended for energy conversion
Fuelwood	Woodfuel where the original composition of the wood is preserved
Gross calorific value (qgr)	Absolute value of the specific energy of combustion, in joules, for unit mass of a solid fuel burned in oxygen in calorimetric bomb under the conditions specified. The result of combustion are assumed to consist of gaseous, oxygen, nitrogen, carbon dioxide and sulphur dioxide, of liquid water (in equilibrium with its vapour) saturated with carbon dioxide under conditions of the bomb reaction, and of solid ash, all at the reference temperature and at constant volume. Old term is higher heating value.
Net calorific value (qnet)	Under such conditions that all the water of the reaction products remains as water vapour (at 0.1 MPa), the other products being as for the gross calorific value, all at the reference temperature. The net calorific value can be determined at constant pressure or at constant volume. Old term is lower heating value. Net calorific value as received (qnet,ar) is calculated by the net calorific value from dry matter (qnet,d) and the total moisture as received.
Renewable energy	Consists of energy produced and/or derived from sources infinitely renovated (hydro, solar, wind) or generated by combustible renewables (sustainably produced biomass); usually expressed in energy units and, in the case of fuels, based on net calorific values.
Wood energy, forest energy	Energy derived from woodfuels corresponding to the net calorific value of the fuel
Wood energy systems	All the (steps and/or) unit processes and operations involved for the production, preparation, transportation, marketing, trade and conversion of woodfuels into energy
Woodfuels, wood based fuels, wood-derived biofuels	All types of biofuels originating directly or indirectly from woody biomass

2.4 Conversion factors

Table 2.6 - Energy conversion factors

To:	TJ	Gcal	Mtoe	MBtu	GWh
From:	multiply by:				
TJ	1	238.8	2.388 x 10 ⁻⁵	947.8	0.2778
Gcal	4.1868 x 10 ⁻³	1	10 ⁻⁷	3.968	1.163 x 10 ⁻³
Mtoe	4.1868 x 10 ⁴	107	1	3.968 x 10 ⁷	11630
MBtu	1.0551 x 10 ⁻³	0.252	2.52 x 10 ⁻⁸	1	2.931 x 10 ⁻⁴
GWh	3.6	860	8.6 x 10 ⁻⁵	3412	1

Table 2.7 - Mass-to-energy conversion factors

Factors applied for IEA country statistics						
Country	Biogasoline		Biodiesel		Other Liquid Biofuels	
	Ktoe/Kton	TJ/Kton	Ktoe/Kton	TJ/Kton	Ktoe/Kton	TJ/Ktonn
Canada	0.6400	26.79552				
France	0.8567	35.86835	0.904401	37.86546		
Germany	0.6401	26.79971	0.8895	37.24159	0.8981	37.60165
Italy			0.88	36.84384		
Japan						
Russia						
United Kingdom	0.6400	26.79552	0.88	36.84384		
United States	0.6388	26.74528	0.9777	40.93433	0.515501	21.58299
Brazil	0.6500	27.2142			0.65	27.2142
People's Republic of China						
India	0.6400	26.79552				
Mexico						
South Africa						
OECD Total	0.6422	26.88833	0.899059	37.64179	0.68569	28.70848
World	0.6448	26.99577	0.899009	37.63971	0.656342	27.47974

Table 2.8 - Basic Woodfuels parameters and conversion factors (FAO)

LHV wood	13.8	MJ/ kg	
LHV charcoal	30.8	MJ/ kg	
Charcoal/fuelwood	165	kg charcoal/ CUM	
Wood density	725	kg/ CUM	air dry average
Black liquor availability	2.27	CUM/ ton chemical pulp	

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