Opportunities and barriers for international bioenergy trade

Martin Junginger[1,*], Jinke van Dam[1], Simonetta Zarrilli[2], Fatin Ali Mohamed[3,] Didier Marchal[4], and Andre Faaij[1]

1 Copernicus Institute, Utrecht University, Heidelberglaan 2, 3584 CS Utrecht, The Netherlands
2 UNCTAD, Palais des Nations, CH -1211 Geneva 10, Switzerland
3 UNIDO, UNIDO Headquarters, Vienna International Centre, A-1400 Vienna, Austria
4 Walloon Agricultural Research Centre, Chaussée de Namur 146, B-5030 Gembloux, Belgium

* Corresponding author, Tel. +31-30-2537613, h.m.junginger@uu.nl

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Abstract

In the past years, the international trade of various bioenergy commodities has grown rapidly, yet this growth is also hampered by a number of barriers. The aim of this paper is to obtain an up-to-date overview of what market actors currently perceive as major opportunities and barriers for the current and future development of international bioenergy trade. The work focuses on three internationally-traded bioenergy commodities: bioethanol, biodiesel and wood pellets. Data was collected through an internet-based questionnaire. The majority of the 141 respondents had an industrial background, with other contributions from NGO's scientists, policy makers and other groups (e.g. certifiers). Geographically, two thirds were from (mainly Western) Europe, with other minor contributions from all other continents. Results show that import tariffs and sustainability criteria are perceived as major barriers for the trade of bioethanol (and to a lesser extend of biodiesel), while logistics are seen as a major obstacle, especially for wood pellets. Development of technical standards was deemed more as an opportunity than as a barrier for all three commodities. Phytosanitary measures were not an issue for any of the investigated commodities, but may prevent the trade of other (mainly solid and unrefined) biomass, such as wood chips. Most important drivers for international biomass trade were high (and strongly fluctuating) oil prices, and strong global policies on a) greenhouse gas emission reductions, b) the use of biomass for heating and electricity, and c) the use of biofuels for transportation. Concluding, some barriers for bioenergy trader are commodity specific, and will need specific actions to overcome. As a first step, import tariffs for biofuels could be reduced or abolished, linked to multi-national trade agreements and harmonization (including provisions on technical standards and sustainability requirements) which might provide the necessary preconditions for further sustained growth of international bioenergy trade.

A shortened version of this report has been submitted to Energy Policy. This background report contains additional information, including the original survey and all answers provided by the respondents. Preferably, please use the following reference for citation:

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1. Introduction

Background: Task 40 under the IEA Bioenergy Agreement entitled: 'Sustainable International Bioenergy trade; securing supply and demand', started in 2004 and currently has fourteen country members and the European Commission. A key element of the work program is to monitor and analyze experiences with the rapidly growing international bioenergy[1] trade in solids, liquid fuels and power while simultaneously evaluate opportunities and barriers for the development of a sound international market. In 2006, Task 40 produced a first overview of opportunities and barriers for sustainable international bioenergy trade and strategies to overcome them[2]. This overview was mainly based on the anecdotal information from task 40 country reports and from the expertise of all task 40 members.

Other work: Since the previous Task 40 publication in November 2006 (Junginger et al., 2006), the use of (liquid) biofuels has received a lot of (largely negative) attention. In Germany, for example, the authorities have decided to reduce quotas and to increase taxes following the controversy on the ecological integrity of biofuels, and probably also due to the cost borne by the German economy (EurObserv'ER, 2009). Consequently the role of international trade in biofuels has been discussed by several authors (see e.g. Dufey, 2007; EurActiv, 2009; Heinimö and Junginger, 2009; Londo et al., 2010; Murphy 2008; Oosterveer and Mol, 2010; Steenblik, 2007; De la Torre Ugarte, 2008; and Zarrilli, 2008). However, these are all qualitative assessments. To our knowledge no quantitative inventory of barriers for bioenergy trade has been established so far based on stakeholder input. Also, these studies focus (almost) solely on liquid biofuels for transportation, neglecting a similarly rapidly growing international solid biomass fuel market.

Aim, scope and timeframe of this study: In 2008, Task 40 decided that renewed and more comprehensive effort was necessary to get an overview of current opportunities and barriers for international bioenergy trade. The **aim is this time to get an up-to-date overview of what the market actors currently perceive as major opportunities and barriers for the current and future development of international bioenergy trade**. The work will focus on three internationally-traded bioenergy commodities: 1) bioethanol 2) biodiesel 3) wood pellets. The choice for these commodities is motivated by a) a strong growth of trade in the past decade and b) the expected further growth in coming years due to the ambitious biofuels & renewable electricity targets in the EU, the US and elsewhere, current high and volatile fossil fuel prices and commitments to reduce GHG emissions. Definitions of terms and background information on the three commodities investigated is given in section 2.

Describing barriers and opportunities is politically sensitive. An issue that market actors in one world region may see as a barrier to bioenergy, may for market actors in another region be regarded as an opportunity. Our aim is to make an overview of these different views, identify common viewpoints, and, where different views exist, thrive to describe these equally.

This report organizes as follows: section 2 provides a number of definitions and describes the methodology and data collection. Section 3 a brief overview of the production and trade of the biomass commodities investigated is presented. Next, in section 4, an overview of the bioenergy trade barriers and opportunities is given, subdivided for each topic into a literature review and an overview of the survey results. These are summarized an discussed in section 5.

[1] See Appendix 1 for the definition of bioenergy, biomass and various other terms.
[2] See www.bioenergytrade.org

2. Definitions and methodology

2.1 Definition of trade barriers

For this paper, we do define 'barriers for international bioenergy trade' very widely, mainly determined by what various stakeholders may perceive as a barrier to bioenergy trade. Principally, a bioenergy trade barrier is defined as *any issue that either directly or indirectly hinders the growth of international **trade** of biomass commodities for energy end-use*. It is difficult to draw a clear line what (indirect) *trade* barriers are, and what *general* barriers hamper the use of biomass (irrespective of being traded or used domestically). For example, the current food-vs-fuel debate (e.g. should vegetable oils be used as feedstock for biodiesel) affects biomass use in general, and will not be discussed here as specific barrier to trade. Yet, this debate is likely to have direct impacts on the amount of ethanol, vegetable oils and biodiesel traded globally in the coming years. Also the global economic crisis is affecting bioenergy trade, but as it also affects biomass production, consumption, oil prices etc., we do not list it as a 'trade barrier'.

In the expert literature, "trade barriers are typically classified as tariff, para- and non-tariff barriers (UNCTAD, 2008). The United Nations Conference on Trade and Development (UNCTAD) is also carrying out further work to develop methodologies, classifications, quantification and development impacts of Non-Tariff Barriers (NTB's) to trade (UNCTAD, 2006). These definition systems, however, have neither been used for this paper nor for the questionnaire, as many of the market actors we target in the questionnaire may not be familiar with it, and such a detailed classification may deter participants from fully completing the questionnaire.

2.2 Methodology and data collection

To obtain input from market actors, an online questionnaire was designed. Based on a literature survey, a number of categories of trade barriers were defined and used in the questionnaire. These categories are presented and described further in section 4.2-4.7, along with concrete examples. They focus on three selected bioenergy commodities: bioethanol, biodiesel and wood pellets. For each category, a number of questions (with a number of predefined possible answers) were asked. The questionnaire also contained two free sections, one where stakeholders could indicate what additional barriers they had encountered in bioenergy trade, and a second section where they could highlight the opportunities they saw for the future. These are discussed in sections 4.8 and 4.9 respectively.

The questionnaire was mainly aimed at industry actors (e.g. producers, traders, consumers and industry associations) and their view on opportunities and barriers for bioenergy trade. To a lesser extent, the questionnaire was also sent to policy makers, NGOs and other experts from academia and other institutions. The questionnaire was open for all parties interested, and was openly advertised on the Task 40 homepage. A copy of the questionnaire is available in appendix 9 of this report.

The questionnaire was designed and tested internally with the members of IEA Bioenergy Task until the end of 2008. After this, the questionnaire was open between February 12th and July 24th 2009. To obtain a comprehensive market overview, the questionnaire was sent to all contacts of the Task 40 national team members. In addition, to reach a large amount of stakeholders, cooperation was sought with UNCTAD and UNIDO. UNIDO was able to send out the questionnaire to almost 1000 biomass producers and traders across the world. Finally, in addition, the invitation was sent to market actors outside the Task 40 member countries, which have considerable trade volumes, e.g. Malaysia,

Indonesia, Argentina etc. for biodiesel and several Eastern European countries for wood pellet production. Many of the major bioethanol producers and consumers (Brazil, US, and many EU countries) are all members of Task 40. Also, several bioenergy / industry associations in these regions were contacted and asked to distribute the questionnaire to their members as well.

3 Overview of the commodities investigated: bioethanol, biodiesel and wood pellets

In this section, a brief overview of the production and trade of the biomass commodities investigated is presented. In table 1a summary is shown for bioethanol, biodiesel and wood pellets.

Table 1: Overview of global production and trade of the major biomass commodities in 2008

	Bioethanol	Biodiesel	Wood pellets
Global production in 2008 (tonnes)	52.9[b]	10.6[c]	11.5[d]
Global net trade in 2008 (tonnes) [a]	3.72[b]	2.9[c]	Approx. 4[d]
Main exporters	Brazil	United States Argentina, Indonesia and Malaysia	Canada, USA, Baltic countries, Finland, Russia
Main importers	USA, Japan, European Union	European Union	Belgium, Netherlands, Sweden, Italy

a While biodiesel and wood pellets are almost exclusively traded as an energy carrier, bioethanol may also be used of other end-uses. As a rough guess, more than 75% of the traded bioethanol is used as transport fuel.
b Based on FAPRI (2009), EurObserv'ER (2009) and Martinot and Sawin (2009)
c Based on FAPRI (2009), (Martinot and Sawin, 2009), (CARD, 2008) and EurObserv'ER (2009)
d Based on Sikkema et al. (2009), Bradley et al. (2009) and Spelter and Toth (2009).

3.1 Bioethanol

Bioethanol (ethyl alcohol) is a liquid biofuel which is currently mainly produced from organic feedstocks containing sugars – such as sugarcane, corn, wheat, sugar beet, molasses, and other crops/feedstocks containing sugar or starch – through a fermentation process. Fuel bioethanol is traded under HS code 2207, which covers denatured and undenatured alcohol. Both can be used as fuel ethanol, but denatured ethanol is often used as solvent (UNCTAD, 2008). In this case a chemical compound is added to ethanol to make it undrinkable and removing it is expensive (Rosillo-Calle and Walter, 2006). Anhydrous bioethanol (ethanol with less than 1% water) can be blended with gasoline in varying quantities up to pure ethanol (E100), and most spark-ignited gasoline style engines will operate well with mixtures of 10% ethanol (E10). Cars with especially designed engines (so-called flexi-fuel cars) can run on any mix of gasoline and hydrous bio-ethanol. In literature the term "ethanol" is used more frequently than the term "bioethanol". In this paper, the term 'bioethanol' is used to indicate that ethanol was produced from organic feedstocks. Bioethanol can also be processed further to ETBE, which can also be blended with gasoline as a biofuel. However, within the frame of this study we only analyze the trade of bioethanol.

Production. The European bioethanol production estimations for 2008 vary between 2.8 billion litres / 2.2 million tonnes (according to EBIO) and 2.3 billion litres / 1.8 million tonnes according to the European Union of Ethanol Producers (EurObserv'ER, 2009). These figures show a strong growth for European bioethanol production after a significant slowdown in production growth between 2006 and 2007. In the USA, production of ethanol reached 9,000.0 million gallons (about 27 million tonnes) in 2008, whereas Brazil produced 6,472.2 millions gallons (about 19.3 million tonnes).

World fuel ethanol production increased by 34% in 2008 to 67 billion litres (about 52.9 million tonnes). Thus, global fuel ethanol production by 2008 had more than doubled from 30 billion litres (about 23.7 million tonnes) in 2004 (Martinot and Sawin, 2009). The two leading ethanol producers for the year 2008 were the United States (34 billion litres, 26.8 million tonnes) and Brazil (27 billion litres, 21.3 million tonnes). They represented 91% of the 2008 world production. Projection for

global production in 2009 and 2010 are respectively 19.98 billion gallons (59.7 million tonnes) and 22.12 billion gallons (66.1 million tonnes) (FAPRI, 2009).

Consumption: The United States consumes more bioethanol as transportation fuel than any other country in the world. In 2008, total consumption was about 9,511 million gallons (about 28.4 million tonnes) of which about 4.6% was imported. Brazilian fuel bioethanol consumption amounted in 2008 to approximately 5,509 million gallons (=about 16.5 million tonnes). In the EU, the consumption of bioethanol for transportation is largest in France, Germany, Sweden and The Netherlands (EurObserv'ER, 2009). Europe produced in 2008 an amount of ethanol equivalent to 64% of its consumption. Total consumption in 2008 in the EU was 887 million gallons (= 2.6 million tonnes) (FAPRI, 2009).

Global trade: Data related to fuel bioethanol trade are imprecise on account of the various potential end-uses of ethanol (i.e. fuel, industrial use, and beverage use) and also because of the lack of proper codes for biofuels in the HS. Brazil is the largest exporter, with the USA and the EU being the largest importers. In 2008, total trade of ethanol was estimated to be about 3.7 million tonnes, with Brazil as the main exporter, and the USA, EU, Canada, EU and Japan as the main importers. According to FAPRI (2009), world ethanol net trade increased by 20.2% in 2008; it decreases in 2009 by 1.3%. EBIO estimates imports at 1.9 billion litres /1.5 million tonnes (400 million litres / 350 thousand tonnes more than in 2007) including 1.4-1.5 billion litres / 1.1-1.2 million tonnes from Brazil. The United Kingdom and Sweden are among the largest European importers. It is estimated that in 2008, the EU imported about 32% of all ethanol used as transport fuel.

Table 2 Overview of bioethanol trade in 2008 (million litres). Source: FAPRI (2009)

Net Exporters		*Net Importers*	
Brazil	4410	United States	1651
China	197	European Union	1204
		Canada	625
		Japan	564
		ROW	563
Net Exports	**4607**	**Net Imports**	**4607**

3.2 Biodiesel

Biodiesel refers to a vegetable oil- or animal fat-based diesel fuel consisting of long-chain alkyl (methyl, propyl or ethyl) esters. Typical feedstocks for biodiesel are vegetable oils such as rape seed oil, soy bean oil, palm oil etc. or animal fat (tallow). Esterification is mainly carried out with methanol. Biodiesel is meant to be used in standard diesel engines and is thus distinct from the vegetable and waste oils used to fuel converted diesel engines. Biodiesel can be used alone, or blended with fossil diesel.

Production: World biodiesel production increased sixfold from 2 billion litres (about 1.8 million tonnes) in 2004 to 12 billion litres (about 10.6 million tonnes) in 2008 (Martinot and Sawin, 2009). The EU is responsible for about two-thirds of world biodiesel production, with Germany, France, Italy and Spain being the top EU producers. By the end of 2008, EU biodiesel production capacity reached 16 billion litres (=14.1 million tonnes) per year. Actual European biodiesel production rose to 7.8 million tonnes in 2008, equivalent to a 35.7% increase between 2007 and 2008. Outside of Europe, the main biodiesel producers include the United States, Argentina and Brazil.

Consumption: In the European Union, currently by far the largest biodiesel consumer, biodiesel consumption in 2008 amounted to about 9.2 million tonnes (EurObserv'ER, 2009). The largest single consuming country was Germany, with 2.9 million tonnes in 2008. While policies aimed at stimulating the use of biodiesel have been put in place in several other countries outside the EU, actual use remains still limited.

Global trade: Biodiesel is mainly traded under HS Codes 38249099 and 38249029 (biodiesel 100%). In table 1, an overview of trade flows is shown. There is evidence that trade in biodiesel has been increasing strongly since 2005. For example, in the US, imports of biodiesel increased from less than 130,000 tonnes in 2005 to more than 200,000 tonnes in 2007. Exports increased even more, from less than 130,000 tonnes in 2006 to more than 1.25 million tonnes in the first half of 2008 (January until August) alone. More than 95% of global exports in 2008 were directed towards the EU (CARD, 2008). The EU has the world's most developed biodiesel industry in 2008, since its production increased 6%. The production declines 7% in 2009 because of strong competition from abroad (FAPRI, 2009): The European biodiesel industry has suffered from biodiesel imports from the United States over the last few years. US gross exports have increased from negligible levels in 2005 to about 1.4 million tonnes in 2008 (EBB 2009c), compared to net export about 1.175 million tonnes, (FAPRI, 2009). Also Argentine exports to EU increased strongly from 70 000 tonnes in 2008 to an estimated 1 million metric tonnes in 2009 (EBB, 2009b). EBB explains the strong increase in American biodiesel imports (produced essentially from soybean) primarily by US government subsidies of $264 per m^3 ($300 per tonne), see also section 4.1.1. Brazil (a major biodiesel producer) does not export biodiesel in any significant quantities because of a domestically mandated renewable fuel requirement that 3% of its biodiesel must be included in its diesel pool (Taylor, 2009).

Table 3 Overview of biodiesel trade in 2008 (Million Litres). Source: FAPRI (2009).

Net Exporters		*Net Importers*	
Argentina	999.42	European Union	1,135.71
Brazil	-3.78	Japan	15.14
Indonesia	386.14	ROW	1,760.35
Malaysia	193.07		
United States	1,336.35		
Net Exports	**2,918.77**	**Net Imports**	**2,918.77**

3.3 Wood pellets

Wood pellets are a type of wood fuel generally made from compacted sawdust. They are usually produced as a byproduct of sawmilling or other wood transformation activities. In past years, increasingly also round wood and wood chips are used as feedstock. Wood pellets typically have a low moisture content (below 10%) and a high energy density compared to many other solid biomass types. These properties allow efficient storage and long-distance transport. Wood pellets can be used on various scales, ranging to combustion in stoves for heating of households to (co-)firing for electricity production in plants with over 100 MW electrical capacity.

Production mainly takes place in Europe and North America. As a rough estimate, approximately 630 pellet plants produced about 8 million tonnes of pellets in 30 European countries for the year 2008. The average Europe utilisation rate of pellet production capacity in 2008 was about 54%. The 2009 pellets production in Europe is estimated at about 8.3 million tonnes (Sikkema et al., 2009). The North American production has grown from 1.1 million tonnes in 2003 to 3.2 million tonnes in 2008. Wood pellet production in the United States in 2008 amounted to 1.8 million tonnes, which

represented 66% of capacity. In Canada, the estimated production was 1.4 million tonnes (81% of capacity). Indications are that both production capacity and actual production have increased during 2009, especially in the US and several European countries. This production volume has been built up within the last decade. Before 1998, pellets were only used on a marginal scale, mainly in Scandinavian countries and Austria.

Consumption is high in many EU countries and the US. Following Sikkema et al. (2009), the European consumption for 2009 is expected to be about 8.5 million tonnes. Countries having a high consumption level are Sweden, Denmark, the Netherlands, Belgium, Germany and Italy. Sweden is by far the largest user of pellets (1.8 million tonnes), whereas the other countries cited have estimated consumption levels around one million tonnes. End-uses can vary widely: from small-scale residential heating systems (heating single houses), to medium-scale district heating and CHP systems to co-firing in large-scale coal power plants. Use for domestic heating is especially common in Austria, Italy, Germany and the US. Use of pellets for mainly co-firing is currently occurring in the Netherlands, Belgium (Marchal et al., 2009; Ryckmans et al., 2006) and the UK. In Sweden, Finland and Denmark, pellets are used on all scales.

Global trade has been growing exponentially for the past ten years. The first intercontinental wood pellet trade has been reported in 1998, for a shipment from British Columbia (Canada) to Sweden. Since then, Canada has been a major exporter of wood pellets, both to Europe (especially Sweden, the Netherlands and Belgium), but also to the US. In recent years, the US has also started to export wood pellets to Europe, and Canadian producers have started to export to Japan. For 2007, it is estimated that about 495,000 tonnes were exported to the US (primarily by train), 740,000 tonnes were shipped from Canadian producers to European consumers, another 110,000 tonnes to Japan (Bradley et al. 2009). Regarding European trade, in 2009, total imports of wood pellets by European countries were estimated to be about 3.4 million tonnes, of which about half of it can be assumed to be intra-EU trade. Total export is estimated at 2.7 million tonnes, predominantly intra –EU trade.

Large pellet markets (larger than 500,000 tonnes) can be found in Austria, Belgium, Denmark, Germany, Italy, the Netherlands, Russia and Sweden (Sikkema et al., 2009). Total 2009 export is estimated at 2.7 million tonnes, mainly intra trade. Some large markets, such as Germany and Austria, are largely self-sufficient, other markets depend on the import of wood pellets, like the Netherlands, Belgium and Denmark. Rotterdam is one of the major hubs for imported pellets, St. Petersburg and Riga those for export.

Main trade routes of European pellet volumes are from North America to the Netherlands and Belgium, having average overseas shipments of 20,000 to 30,000 tonnes per freight, and from Baltic States and Russia to Scandinavia by coasters, having average loads from 4,000 to 6,000 tonnes. There are also important route by truck (average loads: 24 tonnes) from Austria to Italy (Sikkema et al., 2009).

Unfortunately, there is not (yet) a dedicated code for wood pellets in the Harmonized System Commodity Description and Coding System (HS). They are generally traded under HS code 4401300000 (440130 Sawdust and wood waste and scrap, whether or not agglomerated in logs, briquettes, pellets or similar forms), most frequently under 44013090 (wood waste, non sawdust). However, since the 1st of January 2009, official export and import figures on pellets are published by Eurostat using the CN product code “44.01.3020”, defined as “sawdust and wood waste and scrap, agglomerated in pellets” (Sikkema et al., 2009).

4. Bioenergy trade barriers – a review of literature and stakeholder views

4.1 General survey response

In total, 141 participants completed the questionnaire, although not every participant responded to each question. Typically, between 80 and 110 respondents provided answers to the individual questions. As can be seen in figure 1, the majority of participants had an industrial background (including producers, consumers and traders), with other contributions from NGO's scientists, policy makers and other groups (e.g. certifiers). When asked about their expertise, most participants indicated that they had specific expertise on one of the chosen commodities; 13% indicated to have general expertise (see figure 2). Regarding the geographical distribution of the respondents, more than two thirds were from (mainly Western) Europe, with other minor contributions from North America (almost exclusively from the US), South America (Brazil and Argentina), Africa (mainly South Africa) Asia (amongst others Malaysia, Indonesia, South Korea and Japan) and a single participant from Australia (see figure 3).

In the following sections, each of the trade barrier categories formulated will be shortly described based on a literature review, followed by an overview of the responses and particular comments by individual respondents. The survey results are presented for each of the possible trade barriers. In the graphs displaying the results, a differentiation is made between the answers given by all respondents, and the answers provided by (self-indicated) experts for the specific commodity (bioethanol, biodiesel or wood pellets).

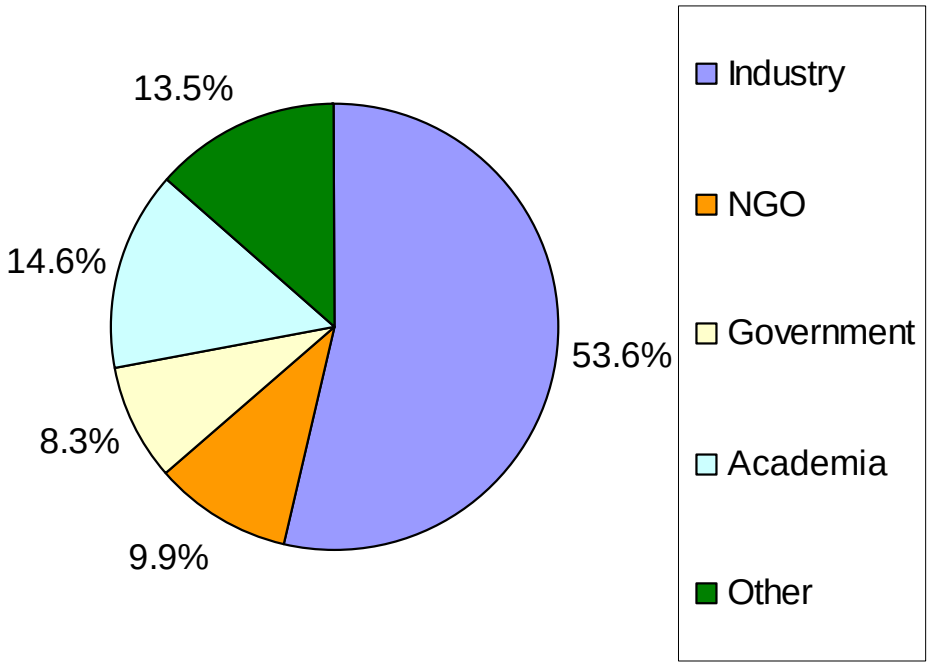

Figure 1. Background of the questionnaire respondents.

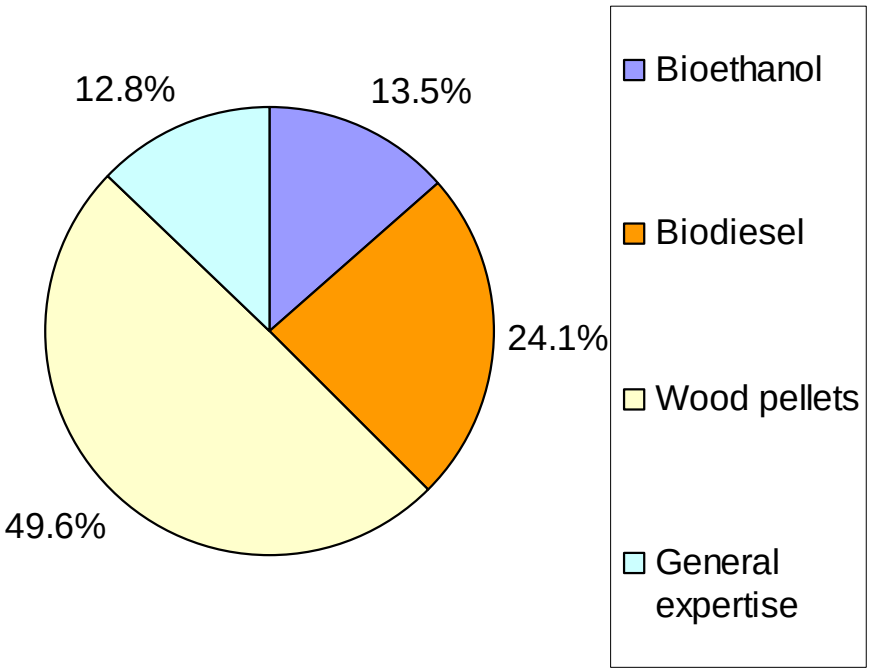

Figure 2. Area of main expertise of the questionnaire respondents.

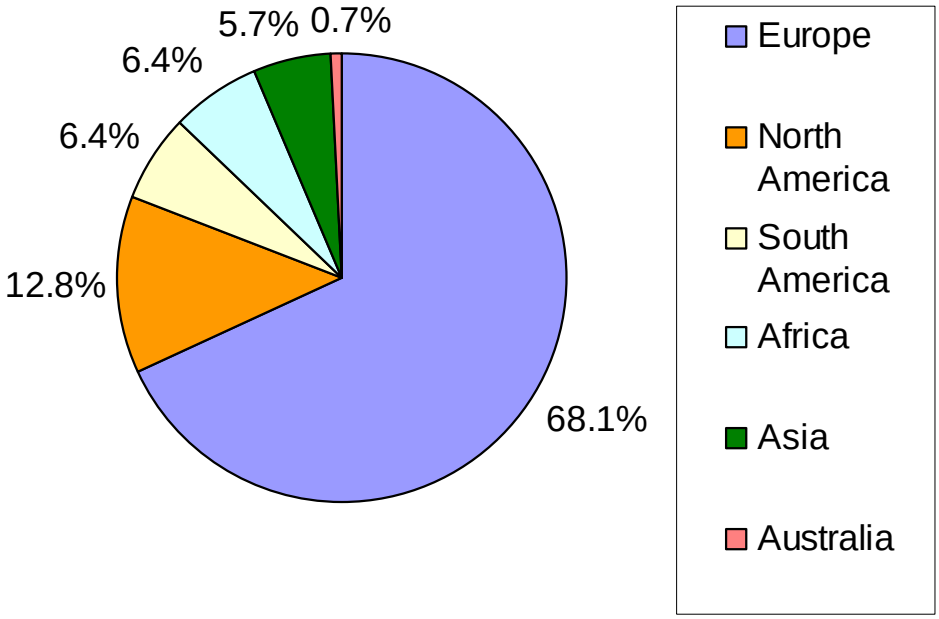

Figure 3. Geographical origin of the questionnaire respondents.

4.2 Impact of national/regional protectionist policies and tariff barriers

4.2.1. Literature review

The use of biofuels is supported in many countries by governments, the main drivers of biofuels support policies being energy independence (linked to high and volatile fossil fuels prices), climate change stabilization (linked to the potential greener profile of biofuels as compared to fossil fuels) and rural development (linked to the fact that biofuels feedstocks are agricultural commodities). To mitigate the generally higher production costs of biofuels, many governments have supported domestic production through the granting of incentives, such as tax exemptions and subsidies. Countries, especially developed ones, have each set up their own support schemes, with the result of shielding domestic producers from foreign competition and hindering international trade. Incentives are often geared towards the promotion of domestic agricultural feedstocks and interests, rather than the promotion of biofuels with economic, energetic or environmental advantages. For a comprehensive overview of subsidies for liquid biofuels, see Steenblik (2007). Similarly, for the use of solid biofuels for heating and electricity production, various support mechanisms exist, such as feed-in premiums, tax exemptions or quotas. In principle, three different policy instruments can be distinguished:

1) Measures to promote domestically produced biomass (in some cases over imported biomass) for energy purposes

Governments support the biofuels industry through a multiplicity of policies and instruments. At the beginning of the supply chain are subsidies to goods and services that are consumed in the production process. Among the largest of these are measures supporting producers of biofuel feedstocks. These subsidies are often accompanied by grants, or reduced-cost credit, for building the necessary infrastructure to convert feedstocks into fuels, namely ethanol refineries and biodiesel manufacturing plants. These types of subsidies have the effect of both lowering the fixed costs and the investor risks of new plants, and of improving the return on investment. Then there are the subsidies directly linked to the volumes produced or used. Indeed, biofuel producers benefit from exemptions from fuel-excise taxes, and from grants or tax credits related to the volume of biofuels produced, sold or blended with fossil fuels. Tax credits are specific allotments of money that are given to oil companies when they blend biofuels into their fossil fuels, or to the biofuels industry.

The following list includes a number of examples of policy measures promoting the use of (domestic) feedstocks for liquid biofuel production:

- In France, tax exemptions are available only for biofuels that are both produced and sold in the French market. Producers from other EU countries are thus excluded, leaving them at a competitive disadvantage (Euractiv, 2008).

- In the United States, Support is also provided to the downstream segment of the biofuels market through grants, tax credits and loans to build the infrastructure needed for the storing, distribution and retailing of biofuels and to purchase fleets that can transport them. Finally, government procurement programmes may give preference to the purchase of biofuels (Koplow, 2009)

- In the United States almost all production stages of biofuels are subsidized; in many locations producers could tap into multiple subsidies at once. Steenblik (2007) reports that several U.S. states provide their own volumetric subsidies to support in-state production of bioethanol or biodiesel at rates equivalent to € 0.04 per litre or more. In a few cases, these subsidies are contingent on the use of feedstock produced in the same state (in addition to federal subsidies). Indeed producers could tap into multiple subsidies at the same time.

Furthermore, companies that blend ethanol into gasoline, including imported ethanol, benefit from a Volumetric Ethanol Excise Tax Credit of $0.45 per gallon. Companies that blend biodiesel, excluded imported biodiesel, into diesel fuel benefit from a Volumetric Biodiesel Tax Credit of $1 per gallon. Producers of cellulosic ethanol benefit from a production tax credit of $1.01 per gallon (Koplow, 2009). Support is also provided to the downstream segment of the biofuels market through grants, tax credits and loans to build the infrastructure needed for the storing, distribution and retailing of biofuels and to purchase fleets that can transport them. Finally, government procurement programmes may give preference to the purchase of biofuels (Koplow, 2007; Doornbosch and Steenblik, 2007).

- The EU is promoting domestic ethanol production through tax reduction of as much as € 0.65 per litre in Germany and € 0.525 per litre in Sweden (Oosterveer and Mol, 2010).

- Brazil also introduced a Social Fuel Seal to take into account regional social inequalities and the agro ecological potential for biodiesel feedstock production. Certification enables biodiesel producers to benefit from reduced taxation rates on biodiesel, eligible for 80% of the biodiesel volume auctioned. The rate of tax exemption is 100% for biodiesel certified with the Social Fuel Seal produced from castor oil or palm oil in the north and north-east regions, versus 67% for biodiesel produced from any other source in other region (Oosterveer and Mol, 2010).

2) Import tariffs for various biomass commodities:

Tariffs are applied on **bioethanol** imports by both by EU (0.192 € per litre) and the US (0.1427 US$ per litre and an additional 2.5% *ad valorem*). In general, the most-favoured nation (MFN) tariffs range from roughly 6% to 50% on an *ad valorem* equivalent basis in the OECD, and up to 186% in the case of India (Steenblik, 2007).

Several preferential trade arrangements concluded in the past by the EU with developing countries foresaw either no duties or reduced tariffs for ethanol, including the Generalized System of Preferences (GSP, which applies to many developing countries), the Cotonou Agreement (African, Caribbean, and Pacific countries; or ACP Group), the Everything But Arms (EBA) initiative (for developing countries), among others. Pakistan, with a 20 percent share of EU ethanol imports, was the largest exporter under preferential trade arrangements. Other ethanol-exporting developing countries that benefited from EU trade preferences are Guatemala, Peru, Bolivia, Ecuador, Nicaragua, and Panama (which benefited from unlimited duty-free access accorded under special drug diversion programs); Ukraine and South Africa (under the GSP); the Democratic Republic of Congo (under the EBA); Swaziland and Zimbabwe (as ACP countries); and Egypt (under the Euro-Mediterranean Agreement).

The GSP that applied from January 1, 2006, to December 31, 2008, no longer provided for any tariff reduction for ethanol. The situation has not changed with the new GSP, which entered into force on January 1, 2009, and will remain in operation until the end of 2011. However, the special incentive arrangement for sustainable development and good governance, known as GSP+, which offers additional tariff reductions to support “vulnerable” developing countries in their ratification and implementation of international conventions in the fields of human rights, sustainable development, core labor standards, and good governance, provides unlimited and duty-free access to ethanol. Sixteen beneficiary countries have qualified to receive the additional preferences: Armenia, Azerbaijan, Bolivia, Colombia, Costa Rica, Ecuador, El Salvador, Georgia, Guatemala, Honduras, Mongolia, Nicaragua, Paraguay, Peru, Sri Lanka, and Venezuela. An important feature of the GSP is that, whenever an individual country’s performance on the EU market over a three-year period exceeds or falls below a set threshold, preferential tariffs are either suspended or reestablished. This

graduation mechanism is relevant only for GSP and GSP+ preferences, while access for developing countries under EBA is not affected. Pakistan, one of the most competitive ethanol producers and exporters, lost its privileged status under the GSP in October 2005 and appears to be unable to overcome the tariff barrier in the European market.

Duty-free and quota-free access is granted to developing countries under the EBA Initiative. While exports of ethanol from EBA countries have so far been negligible, new opportunities may emerge in those countries, particularly as a result of increased sugar cane cultivation and foreign investments, including from Brazil. Under the Cotonou Agreement, ACP countries qualified for duty-free access for ethanol. However, imports of ethanol from South Africa, which exported on average approximately 5 million liters a year to the EU during 2002–04, have been subject since January 1, 2006, to the full MFN duty. Starting January 1, 2008, new agreements on trade and economic cooperation (the Economic Partnership Agreements) have started replacing the Cotonou Agreement and will govern trade relations between the ACP and the EU.

For both the US and the EU, loopholes in legislation have been reported in the past to circumvent import tariffs. For the EU, blending bioethanol with other chemicals and importing it as miscellaneous chemicals has been reported as a loophole (Desplechin, 2007). In the US, oil companies, the Caribbean Basin Initiative ("CBI") currently allows the of import significant quantities of bioethanol (up to 7% of the US market, 6.8 billion gallons in 2007) without having to pay the tariff mentioned above[3]. A significant share of this bioethanol may originate from Brazil or the EU, which is shipped as wet bioethanol to a CBI country, and, after dehydration, can be re-exported to the US. While some sources have called the indirect import from Brazil a loophole (Lane, 2008), it is legally correct, and one can also argue that CBI countries do not have the capacity to produce enough ethanol to fully use the quota granted to them. The option to dehydrate Brazilian or European ethanol in CBI countries is spurring some investments in those countries[4]...

Biodiesel, classified as chemical under HS 3420.90, used to be subject to much lower import tariffs than bioethanol ranging from 0% in Switzerland to 6.5% in the EU and the USA. Tariffs applied by developing countries are generally between 14% and 50% (Steenblik, 2007). For example, Brazil applies an import tariff of 14%. However in 2008, biodiesel import from the US to Europe increased tremendously. The European Biodiesel Board (EBB) explained the strong increase in American biodiesel imports (produced essentially from soybean) primarily by US government subsidies of \$264 per m^3 (\$300 per tonne). EBB submitted a complaint to the European Commission in April 2008 in order to prevent the situation causing further harm to the European biodiesel industry. They were awarded the case by the Commission in March 2009, through the approval of the temporary imposition (of six months maximum) of antidumping and anti-subsidy rights on American biodiesel imports. On 7th July 2009 this decision was extended by the Council of Ministers for a period of five years. These fees stand between €213 and €409 per tonne (EurObserv'ER, 2009). Furthermore, biodiesel feedstocks as agricultural commodities, are generally protected through agricultural support payments and tariffs. Oilseeds, many of which can be used to produce biodiesel, are an exception for the EU, which has an agreement in place to accept oilseeds duty free (Murphy, 2008)

For **wood pellets**, no examples of import tariffs are known. Russia has recently imposed export tariffs for roundwood, which particularly limits the export to the Baltic countries and Finland (Heinimö, 2008). This in turn diminished the amount of roundwood processed (and sawdust

[3] More specifically, the US allows duty-free and quota-free entry for ethanol from CBI countries on the basis of the CBI and US-CAFTA agreements. If the local feedstock content is lower than 50%, limitations apply on quantity of duty-free ethanol. Nevertheless, up to 7% of the US market may be supplied duty-free by CBI ethanol containing no local feedstocks.

[4] On the other hand, one can argue that CBI countries do not have the capacity to produce enough ethanol to fully use the quota granted to them. The option to dehydrate Brazilian or European ethanol in CBI countries is spurring some investments in those countries.

produced), which in the end effectively limits wood pellet production and export from these countries. While the export tariff on Russian roundwood thus ultimately affects the wood pellet trade, it is only an indirect effect.

3) Export subsidies, intended for domestically-produced biomass

Export subsidies or tariffs can also have an impact on trade of biomass commodities. As a first example, in Argentina, a differential export tax is in place between soy oil (32%) and **biodiesel** (20%). While the Argentine Renewable Energy Chamber argues that this is a "very simple way to create investment incentives that generate more complex and high-paying jobs" (CADER, 2009), while according to the EBB (2009b), it "creates a clear distortion, as it creates an artificial incentive for the production and export of the finished product biodiesel rather than its raw material (soybean oil)", which it considered unfair competition compared to European biodiesel. As a second example, the above-mentioned volumetric biodiesel tax credit was probably not intended as an export subsidy, but certainly did spur exports towards the EU. As a third example, Russia imposed export tariffs for roundwood, which particularly limits the export to the Baltic countries and Finland (Heinimö and Alakangas, 2009). This in turn diminished the amount of roundwood processed (and sawdust produced), which in the end effectively limits **wood pellet** production and export from these countries, and thus indirectly affected the wood pellet trade.

Summarizing, on basis of the literature overview, it seems that tariff barriers are particularly important for liquid biofuels, while no or only indirect tariff barriers for wood pellets (or other solid biofuels) were found in the literature.

4.2.2 Survey results

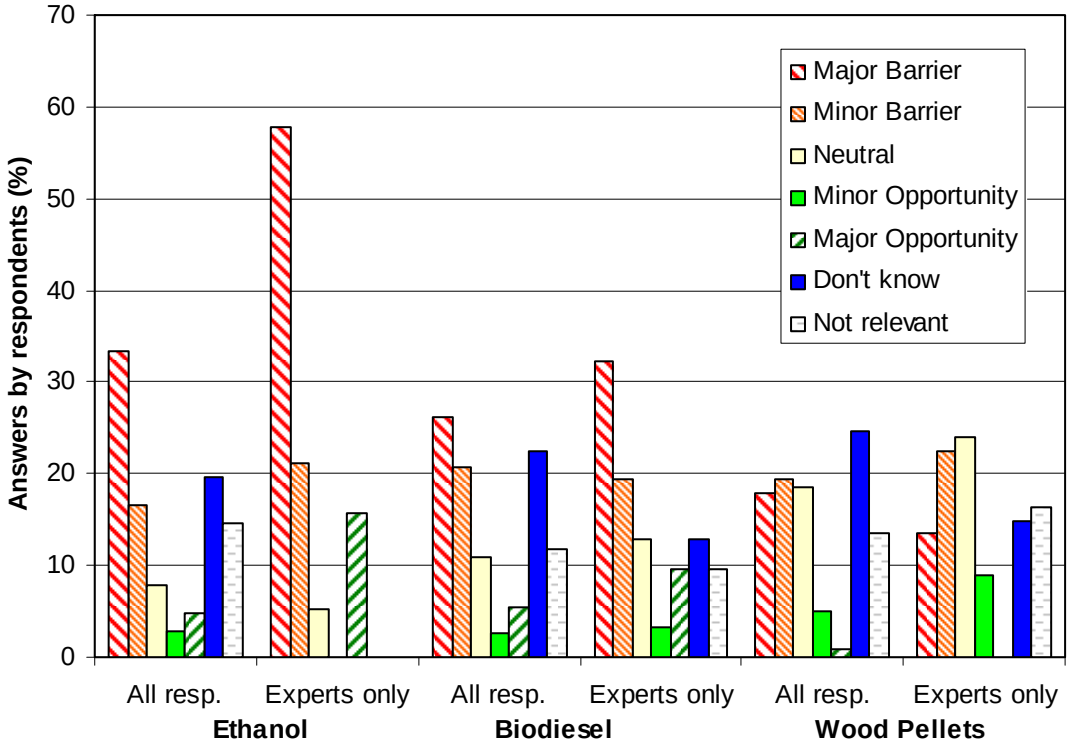

Figure 4. Overview of questionnaire responses on import export tariffs.

The respondents were asked whether tariffs are (or can be) a barrier for the bioethanol, biodiesel or wood pellets, and whether there are also cases where tariffs may stimulate trade. The answers are shown in figure 4.

For wood pellets, all open-text contributions indicated that there are indeed no import or export tariffs in existence. But, as expected from the literature review, a majority of (informed) respondents thought that tariff barriers for ethanol and (to a somewhat lesser extent biodiesel[5]) should be considered a (major) trade barrier.

Regarding the bioethanol trade, a Swedish respondent remarked "Especially the development of the Flexifuel car market (in Europe) is strongly inhibited by the customs on sugarcane ethanol in the EU. A lower import tariff on bioethanol would be a greater competitor to gasoline. The EU focus on not competing with European ethanol production, when the focus should be replacing imported oil products". Similarly, a Brazilian respondent remarked: "The ethanol exports are very limited in major consumption markets (USA and EU) due to trade barriers. The CBI agreement, the way which Brazilian exports go to the USA, does not make any economic or environmental sense, nor the corn ethanol program in USA. If we had free ethanol trade, we would have massive GHG savings."

For biodiesel, a more differentiated picture was found: while still about 45% of all experts thought import tariffs for biodiesel were major or minor barriers for trade, views on this matter differed. A Malaysian producer stated: "By creating Trade Barriers through Import/Export Tariffs, the market for Biodiesel is completely distorted. More expensive and not so environment friendly sources of vegetable oils are used in preference to more cost effective and more environment friendly Biodiesel. In addition when land is scarce for cultivation high yielding crops like Oil Palm have a much better comparative advantage and should be allowed to trade in an open market without trade barriers." An Argentinean remarked that next to import tariffs, also the Argentinean export tariffs were a major barrier to biodiesel trade.

An Italian producer on the other hand defended the use of import tariffs: "The case of the US 'splash and dash' practice for biodiesel well explain how export subsidies might affect biofuel international trade. I think that this kind of market distortion should be avoided in order to allow a fair biofuel chain development in all different market. The EU issue to undertake a balanced approach between import and internal production of biofuel should be pursued by means of fair tariff and trade procedures and at the same time by allowing the development of national biofuels chain with a special care for sustainable local agricultural production."

The European Biodiesel Board (EBB) formulated a comprehensive contribution to this topic (see appendix 1 for all full answers of respondents). They stated "…on the one hand, import tariffs for biodiesel do not represent a trade barrier, especially within the EU, where only a 6,5% ad valorem duty is levied on biodiesel imports. The fact that the EU biodiesel market is not overly protected has been clearly illustrated by the surge of so called US "B99" biodiesel exports to the EU in 2007 and 2008. More than 1,05 million tonnes (2007) and almost 2 million tonnes (2008) of heavily subsidized and dumped US biodiesel were exported to the EU, until anti-dumping and countervailing measures were eventually imposed by the EU last March 12th, following the complaints lodged by EBB. On the other hand, some trade practices emerging at international level are raising major concerns in terms of fair international trade in biodiesel. This is first of all the case for the US subsidy scheme referred to as "blender's credit" (1$/gallon = 300$/tonne) applicable to both biodiesel consumed in the US and exported outside the US. The measures adopted by the EU last March 12th (prolonged for 5 years on July 10th) are of course bringing a major relief for EU producers. These measures against US B99 were not at all a protectionist move but they merely contributed to re-establish the level-playing field that EU biodiesel producers can legitimately enjoy."

[5] Note that the situation for biodiesel changed significantly whilst the questionnaire was open, as the EU initiated anti-dumping and countervailing measures regarding US Biodiesel imports on March 12th 2009.

Furthermore, the EBB considered he Differential Export Tax scheme applicable in Argentina as a major concern, as it ".. artificially incentives the processing of soybean oil into biodiesel, which is then massively exported outside the country.". Finally, it also pointed out that "the tariff preferences currently granted under the EU Generalized System of Preferences (GSP) are particularly questionable in some cases, notably when it comes to Malaysia, Indonesia and Argentina…. the GSP has always been meant to be a development tool, while Malaysia, Indonesia and Argentina are far from being developing countries when it comes to their biodiesel or vegetable oil exports". They also considered the GSP "… as inconsistent, considering that the EU is since July 2009 levying a duty on the corresponding raw material coming from the very same countries (5,1% on palm oil from Malaysia and Indonesia imported under CN code 1511 90 91 10)."

4.3 Impact of technical standards / Technical barriers to trade

4.3.1 Literature review

Technical standards describe in detail the physical and chemical properties of fuels. Regulations pertaining to the technical characteristics of liquid transport fuels (including biofuels) exist in all countries. These have been established in large part to ensure the safety of the fuels and to protect consumers from buying fuels that could damage their vehicles' engines. Two types of technical regulations affect trade in biofuels: maximum percentages of bioethanol or biodiesel which can be mixed with petroleum fuels in the blends commercially available; and regulations pertaining to the technical characteristics of the biofuels themselves. **For bioethanol and biodiesel**, over the course of 2007 experts from standards developing organizations (SDOs) in the United States, Brazil and the European Union (EU) reviewed standards, including the technical documents produced by the American Society for Testing and Materials (ASTM), the Associação Brasileira de Normas Técnicas (ABNT), and the European Committee for Standardization (CEN). They jointly-authored a report that identified 16 standard specifications for bioethanol and 24 for biodiesel that fall into three categories:

- Specifications that are similar among all three regions and can be considered compatible;
- Specifications with differences that could be aligned in the short term (<12 months);
- Specifications for which fundamental differences exist and are deemed irreconcilable.

The U.S., Brazilian and EU experts formed the core team of the Codes and Standards Working Group of the International Biofuels Forum. The Group includes as well China, India and South Africa. The report found "much common ground and few impediments to Biofuels Trade". For bioethanol, 9 of the 16 bioethanol specifications are considered 'in alignment.' All but one of the remaining specifications could be aligned in the short term. Despite modest differences, the report concludes that existing specifications present no impediment to global trade in bioethanol. For biodiesel, however, only six of the 24 biodiesel specifications are considered 'in alignment', while nine factors are deemed irreconcilable. This difference is explained by the fact that bioethanol is a single chemical compound (independently from which feedstock it is produced), whereas biodiesel is not a single chemical entity, but is derived from several types of feedstock that can translate to variations in the chemical composition of the biodiesel (e.g. different chain lengths, varying number of double bonds), which again influences the performance characteristics of the finished fuel.

The report suggests that many differences can be dealt with by blending various types of biodiesel to create an end-product that meets regional specifications for fuel quality and emissions. Other sources (Euractiv, 2009, Jank, 2007) however, have argued that by fixing, for example, maximum levels of iodine for vegetable oils used in biodiesel (based on the argument that these are more suitable for the cooler European climate), the EU is placing a de facto ban on biodiesel produced from palm and soy oils and is largely favouring its main European biodiesel feedstock crop: rapeseed. Thus, **purely technical specifications** (in this example imposed by the EU) **may function as a barrier to (bioenergy) trade.** For example, the EU introduced a biodiesel standard (DIN EN 14214) which fixes, among others, the iodine level required for vegetable oil used for the production of biodiesel, which in turn determines the type of feedstock that can possibly be used. Only rapeseed oil complies easily with this standard, limiting the use of soy oil and (to a lesser extent) palm oil (Oosterveer and Mol, 2010).

For **wood pellets**, for the EU, the CEN/TC 335 working group developed biomass standards to describe all forms of solid biofuels within Europe, including wood chips, wood pellets and briquettes, logs, sawdust and straw bales. Specifically for wood pellets, the CEN/TS 14961 standard

divides wood pellets in various classes regarding size, ash content, mechanical durability etc. Next to this, various European countries have developed their own quality standards, e.g. Austria (Önorm M7137), Germany (DIN51731), and Italy (Pellet Gold).These pellet standards are mainly aimed at pellet use for non-industrial small-scale heating, where e.g. ash content is critical. Pellets for industrial use (e.g, for co-firing with coal) are often not delivered without standards. As an example, GDF-SUEZ / Electrabel utility has developed its own standard for pellets imported to feed power plants in Belgium (Marchal et al., 2009).

While a multitude of different technical standards may hamper trade, this has so far not been reported for wood pellets.

4.3.2. Survey results

The respondents were asked whether standards for ethanol, biodiesel or wood pellets may impede or facilitate international trade. As can be seen in figure 5, about 45% of the ethanol experts and 40% of biodiesel experts thought that technical standards were a minor or major barrier to trade. However, for biodiesel, also more than 25% thought that a technical standard for biodiesel would actually create opportunities for trade. In comparison, regarding wood pellets, more than 50% of the experts thought that the establishment of an internationally accepted technical industrial wood pellet standard would be a (major) step to enhance the global trade.

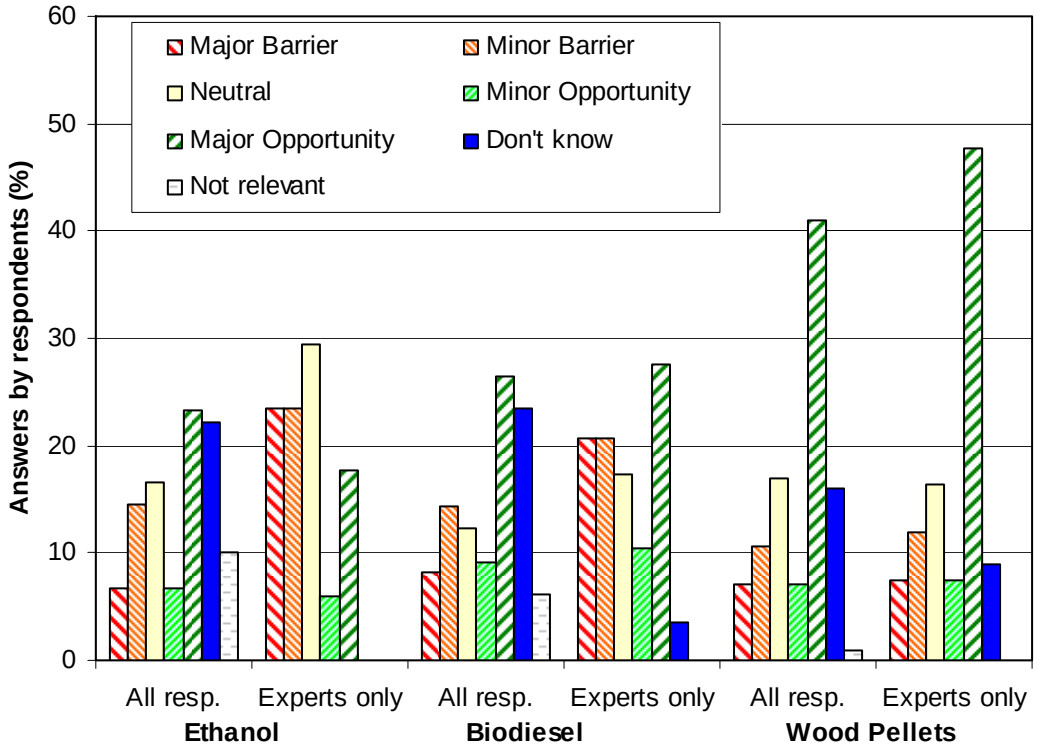

Figure 5. Overview of questionnaire responses on technical standards.

In general, all respondents recognized that technical standards are a basic requirement for large-scale international trade. This was indicated for bioethanol, biodiesel and wood pellets. However, as one of the respondents from Indonesia remarked: “developed countries must be reasonable to set a standard specifically for products from developing countries, because lack of technology and capital. Unless developed countries share the technology and investment, it will be difficult for developing countries to produce bioethanol or biodiesel to meet international high quality standard”. On the other hand, a Belgian respondent argued that “Technical standards regulating biodiesel quality and specifications in the different regions of the world does not represent an obstacle to trade, despite some regional differences”. This has been acknowledged by the EU/US/Brazil Tripartite Task Force in its report on

internationally compatible biofuels standards Tripartite Task Force (2007). More specifically, the report states that “While some methods, test parameters, or parameter limit values are not currently aligned, their non-alignment may not have much of an impact if biodiesel made in one region is destined for use in another region”. The fact that biodiesel standards do not represent an obstacle to trade has been further evidenced by the fact that US B99 biodiesel has been massively exported to the EU in 2007 and 2008, despite some minor differences between the ASTM and EN biodiesel standards.”

For wood pellets, it was mentioned that technical standards will improve confidence in the market and should therefore increase trade. Also, a market actor remarked that there is “..a great deal of uncertainty regarding origin and quality of wood pellets. A strong and commonly used standard may help to remove this uncertainty”. Furthermore, it was pointed out that “standards reduce transaction costs (reduce the cost of information) and thereby facilitate trade”. In addition, respondents raised also (slight) concerns: multiple sets of standards which are not aligned could hamper trade. Also, a too strict standard (e.g. regarding ash content) could cause higher costs for producers, and as (wood pellet) markets are still in a developing stage, standards might hamper the development by blocking out opportunities.

4.4 Sustainability criteria and certification systems for biomass and biofuels

4.4.1 Literature review

In recent years, sustainability requirements have increasingly been imposed (or are considered) on either a) feedstocks (such as palm oil) or b) final products. Such requirements relate to non-product-related processes or production methods (PPMs). The different standards and regulations under consideration are discussed in more detail by van Dam et al. (2008) and van Dam et al. (2010), and can be summarized in three categories:

1. Private-sector business-to-business standards, which are promulgated by non-governmental bodies and are strictly speaking voluntary. Examples for **wood pellets** are the Green Gold Label by Control Union, or the GDF-SUEZ / Electrabel label by SGS and Laborelec ((Marchal et al., 2009; van Dam et al. 2010; Ryckmans et al., 2006) and the sustainability policy for biomass by Drax (Drax, 2009). For **bioethanol**, the 'verified sustainable ethanol initiative' launched by Sekab and UNICA is a clear example of a voluntary industry standard.

2. Voluntary standards, initiated by governments or other private initiatives, which are often implemented in connection with positive labels, and are intended to reward (through the higher prices expected to be paid by concerned consumers) performance beyond the norm. Examples of other initiatives that are the Roundtable on Sustainable Palm Oil (RSPO), the Roundtable on Responsible Soy (RTRS), the Roundtable on Sustainable Biofuels (RSB) and the Global Bio-energy Partnership (GBEP)[6] (see van Dam et al. 2010 for a comprehensive overview). Such voluntary standards may be seen as opportunity to differentiate a product from that of competitors in the market.

3. Regulations linked to tax exemptions, subsidies or other policy instruments which make the eligibility of a biomass product dependent on certification at some stage of its production process or processing. Examples for **liquid biofuels** are the Renewable Transport Fuel Obligation (RTFO) in the UK, the German Biofuel Quota Law, the Energy Independence and Security Act (EISA) in the United States and the European discussion on the draft fuel quality directive and the renewable energy directive (RED) (see van Dam et al. 2010 for an overview). For **wood pellets**, for example Walloon authority imposes that each supplier undergoes an audit within six months for certification of imported biomass, which examines the sustainability of the wood sourcing as well as detail of the energy balance (through an energy audit including GHG emissions) of the whole supply chain (Marchal et al., 2009; Ryckmans et al., 2006).

In 2009, standardization organizations such as CEN and DIN have also announced to develop sustainability standards:

- The European Committee for Standardization (CEN, 2010) has implemented the CEN/TC 383 "Sustainably produced biomass for energy application" technical committee. TC 383 will develop several standards dealing with terminology, calculation of the GHG emission balance associated with sustainable biofuels and bioliquids using lifecycle approach, biodiversity and environmental aspects, conformity assessment (including chain-of-custody).

[6] Both, the BRB and the GBEP are "hybrid" international entities, since they include representatives of governments, of private entities (companies, associations of producers), international organizations and NGOs. It is unclear whether such entities can be regarded as international standardization bodies. If this were the case, the principles and criteria they develop should be regarded as international standards and should be covered by a presumption of conformity with the Agreement on Technical Barriers to Trade (TBT Agreement). On the other hand, if these initiatives are regarded as private schemes which fall outside the scope of the TBT Agreement, they escape from multilaterally-agreed trade rules – such as non-discrimination, abstention from creating unnecessary obstacles to trade, proportionality and transparency. Nevertheless, they could have a significant impact on trade flows.

- International Organization for Standardisation (ISO, 2010) will develop an International Standard to address sustainability issues linked to bioenergy. The standard will be produced by a new ISO project committee, “ISO/PC 248, Sustainability criteria for bioenergy”. ISO/PC 248 will bring together international expertise and state-of-the-art best practice to discuss the social, economic and environmental aspects of the production, supply chain, and use of bioenergy, and identify criteria that could prevent it from being environmentally destructive or socially aggressive. It was decided to develop this new standard due to the growing international interest in bioenergy, and the current lack of globally harmonized sustainability criteria. The future standard (ISO 13065) should help to avoid technical barriers to trade on bioenergy. It will disseminate technical know-how and stimulate the ongoing pursuit for quality through the incentive to research.

It is too early to say whether any of the sustainability certification schemes in existence or proposed will on balance enhance or hinder trade. In the absence of legally binding legislation in many countries, but with the ongoing debate regarding the sustainability of bioenergy (in terms of competition with food, GHG emission reductions, impacts on biodiversity etc.), some private parties have come up with voluntary standards. Such private-sector standards can have a small or a large effect on trade, depending on the share of the market they cover, the way they are implemented, their complexity, and so forth. At the moment, none of the private, voluntary standards appear to be influencing trade flows or volumes.

With the recent publication of sustainability criteria in the renewable energies directive (RED) (European Commission, 2009) *for liquid transport fuels*, this situation has changed. The directive notably provides requirements for greenhouse gas emission reductions, the biofuels in question must not be produced from raw materials being derived from land of high value in terms of biological diversity or high carbon stocks. Furthermore, the Commission shall present a report every two years on the impact of increased demand for biofuel on sustainability in the EC and in third countries, and on the impact of the EU biofuel policy on the availability of foodstuffs at an affordable price, in particular for people in developing countries, and on wider development issues. Also in the USA, the Renewable Fuel Standard (RFS) -included in the Energy Independence and Security Act (EISA) - provides provisions on the promotion of biofuels (especially cellulosic biofuels). EISA mandates minimum GHG reductions from renewable fuels, discourages use of food and feed crops as feedstock, permits use of cultivated land and discourages (indirect) land-use changes.

On the other hand, for *solid* biomass and biogas for heat and electricity, a recent report by the European commission (European Commission, 2010) stated on the other hand that binding criteria would impose substantial costs on European economic actors, bearing in mind that at least 90% of biomass consumed in the EU comes from European forest residues and by-products of other industries. Hence, the report concluded that more detailed legislation is not necessary.

With these developments, it is likely that – at least for the European Union and the USA – sustainability criteria will have a potentially much larger impact on trade of liquid biofuels compared to the trade of solid biomass.

Regarding the development of sustainability criteria and certification systems, a number of (potential major) barriers may be distinguished:

- Criteria, especially related to environmental and social issues, could be too stringent or inappropriate to local environmental and technological conditions in producing developing countries. The fear of many developing countries is that if the selected criteria are too strict criteria or are based on the prevailing conditions in the countries setting up the certification schemes, only producers from those countries may be able to meet the criteria, thus these criteria may act as trade barriers. Many developing nations therefore view attempts to introduce sustainability criteria as a form of "green imperialism". Concerns that the criteria wish to tackle are extremely diverse, ranging from purely commercial aims to rainforest protection, banning the use of genetically

modified crops or preventing child labor. There is a danger that a compromise on the one hand could result in overly detailed rules that lead to compliance difficulties, or on the other hand in standards so general that they become meaningless.

- Linked to strict sustainability criteria, the costs for a) implementing measures to meet the sustainability criteria, and b) monitoring and certification of the biomass produced may worsen the economic competitiveness, especially of small farmers in developing countries. Exploratory studies by Smeets et al (2008) and Smeets and Faaij (2010) indicate that production costs in Brazil for ethanol from sugarcane and may increase to 36% (ethanol from sugarcane) or 42% (eucalyptus wood chips), especially due to strict environmental criteria.

- For biofuels certification schemes sponsored by governments, certification is in most cases linked to tax breaks and other incentives, or it is the precondition for biofuels to be counted towards national or regional utilization targets. Contrary to other certification and labeling initiatives that are meant to influence consumers and help them distinguishing products on the market on the basis of certain characteristics, biofuels certification is linked to important financial benefits or to the capacity to fulfill national utilization targets. These elements make certification an increasingly important issue, including in international trade. Differentiating products, including biofuels, on the basis of how they have been produced and of their impact through their life cycle remains, however, a complex endeavour, both from practical and legal points of view.
- The possible proliferation of different technical, environmental and social sustainability standards for biofuels production: With current developments by the European Commission, different European governments, several private sector initiatives, initiatives of round tables and NGO's, there is a real risk that on the short term a multitude of different and partially incompatible systems will arise. If there are too many schemes in operation, each including a different set of requirements, then compliance, especially by small producers in developing countries, may become difficult. If they are not developed globally (with the participation of both industrialised and developing countries) or without clear rules for mutual recognition – such a multitude of systems could potentially become a major barrier for international bioenergy trade instead of promoting the use of sustainable biofuels production. Additionally, lack of internationally systems may cause market distortions. For example, if different countries or world regions impose different GHG reduction requirement, this may effectively exclude specific region-crop combinations for stringent GHG reduction requirement, causing that these products then are exported to regions with less severe requirements.
- Other issues currently debated are e.g. the inclusion of indirect land use change (iLUC) and food security. These issues cannot easily be tackled by certification systems but require wider land-use management and planning (van Dam et al., 2010).

4.4.2. Survey results

The respondents were asked how sustainability criteria for bioenergy commodities could influence bioenergy trade. This greatly divided the questionnaire respondents, as can be seen in figure 6. Especially for ethanol, there is an extreme difference between the expectation of the experts, where almost 60% considered it a major barrier, and the total of all respondents, where less than 20% expected this to be major barrier. Also, it is remarkable that both for biodiesel and wood pellets, the majority of experts thought that sustainability criteria would be an opportunity for trade. Yet, 25% of all biodiesel experts thought that they were a major barrier – demonstrating that opinions were quite divided.

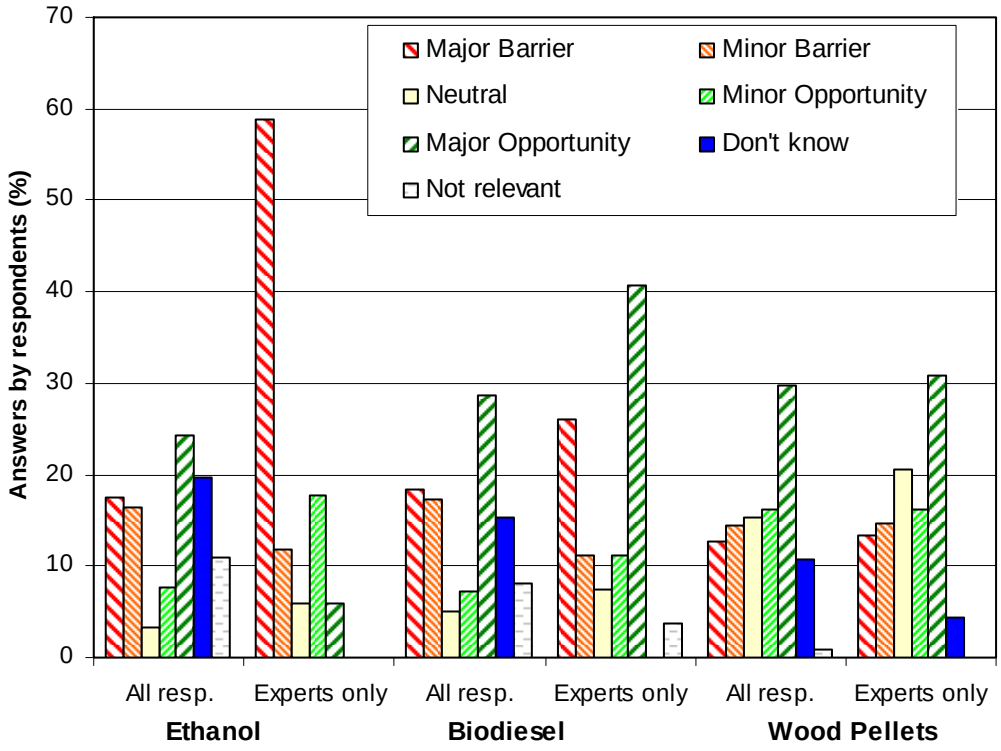

Figure 6. Overview of questionnaire responses on sustainability criteria.

The differing views may largely be explained by the fact that at the moment, there is no universally accepted definition of 'sustainable biomass'. Many respondents agreed that biomass has to be produced sustainably, but it strongly depends on how sustainability criteria are formulated. If too strict, or too many different standards, sustainability criteria may become a major hindrance for trade (for all answers, see appendix 4).

A Brazilian ethanol expert thought that sustainability criteria are not working yet as a major trade barrier, but he feared that as soon as the Energy directive comes in line, it might be a major trade barrier. At the same time, he recognized that they might help the producers to have a cleaner production line. A biodiesel expert from Malaysia was less optimistic: he pointed out that i) sustainability standards are required for biofuels but not for other, similar commodities, with similar environmental, social and GHG impacts, ii) there is continuing future uncertainty due to ongoing review provisions of the EU RED, and iii) it is unclear which standards, certification and Chain of Custody procedures will be applied. His expectation was that sustainability criteria will be used as non-tariff barriers. This view is shared by more organizations from Malaysia and Indonesia: in December 2009, the Malaysian Palm Oil Council (MPOC) announced that Malaysia and Indonesia, the world's leading palm oil producers, and other palm oil producing countries may group together and file a case to the World Trade Organisation (WTO) against the European Union (EU) for introducing sustainability criteria in the RED. In their view, the EU directive seeks to restrict the import of palm oil for biofuel usage in Europe in favor of the heavily subsidized home-grown rapeseed oil (MPOC, 2009).

The EBB conceded that ensuring the sustainability of bioenergy and biomass production is a legitimate concern, but pointed out that the way in which sustainability requirements are implemented at international level can represent a significant barrier to fair international trade. In the view of EBB, the bottom line is that sustainability criteria should be implemented in a transparent, horizontal, cost-effective and WTO-compatible way.

Some wood pellet experts see sustainability criteria as a way to differentiate themselves from liquid biofuels. They remarked that “proof of sustainability of the chain will help wood pellets to be distinguished from other biofuels which have in the past lead to major concerns of the sustainability of biomass in general”. Another expert thought that “Governments are reluctant to subsidize the use of wood pellets because of sustainability issues. A sustainability standard might help. Major users will only use wood pellets that are (internationally) certified, for (1) trading reasons (2) corporate social responsibility reasons, and (3) getting subsidies.” Furthermore, an expert remarked: “…more clarity on sustainability would actually boost biofuels trade; the lack of an agreement on what's sustainable and what's not is hampering the development and use of new products.” One respondent stated that “…there needs to be a minimum level of environmental standards of production. For example, the production of WPs for energy consumption should begin with certified forests”. Another expert worried that “Certifying and monitoring sustainability criteria costs money per ton wood pellets traded. Unless linked to subsidies, this will result in less buying power from EU”. Regarding the administrative burden, a concern was that “sustainability criteria could make it very difficult for WP producers to comply with at the short run. It's another regulation to worry about and this is very time consuming to sort out. This hinders the continuity of trade.“

4.5 Logistical barriers[7]

4.5.1 Literature review

One of the problems of logistical barriers is a general lack of technically mature pre-treatment technologies in compacting biomass at low cost to facilitate transportation, although this is fortunately improving. Densification technology has recently improved significantly e.g. for wood pellets although this technology is only suitable for certain biomass types. Also, the final density per cubic meter is still far less than e.g. oil given the nature of biomass. Pyrolysis or torrefaction may be a possible pre-treatment option, but still there is a need to demonstrate it on a commercial scale. In the case of the import of liquid biofuels (e.g. bioethanol, vegetable oils, biodiesel), this is not an issue, as the energy density of these biofuels is relatively high.

When setting up biomass fuel supply chains for large-scale biomass systems, logistics are a pivotal part in the system (Cherubini et al., 2009; Frombo et al., 2009; Junginger et al., 2001). Various studies have shown that long-distance international transport by ship is feasible in terms of energy use and transportation costs (e.g. Sikkema et al., 2010, Magelli et al., 2009; van Dam, et al. 2009) but availability of suitable vessels and meteorological conditions (e.g. winter time in Scandinavia and Russia) need be considered. Availability of vessels is of course closely linked to international shipping rates of dry bulk (for wood pellets) or dedicated tankers for bioethanol and biodiesel. Shipping rates have been fluctuating strongly in the past years – from 2005 to 2007, and tripling of dry bulk rates were reported for Panamax vessels (Bradley et al. 2009). Shipping rates determine especially for (western Canadian) wood pellets a large percentage of the total costs delivered to the end user in Europe. Harbor and terminal suitability to handle large biomass streams can also hinder the import and export of biomass to certain regions. The most favorable situation is when the end user has the facility close to the harbor avoiding additional transport by trucks.

Local transportation by truck or train (both in biomass exporting and importing countries) may be also a high cost factor, which can influence the overall energy balance and total biomass costs. For example, in Brazil, new sugarcane plantations are considered in the Centre-West, but the cost of transport and lack of infrastructure to transport **bioethanol** to the demand centres (either domestically or for export) can be a serious constraint. Due to the increasing export demand for bioethanol, Brazil is encouraging major investments in dedicated long-distance bioethanol pipelines and terminals. For the US, Steenblik (2007) notes that numerous states and municipalities are helping to finance the upgrading or construction of new rail spurs to biofuel, particularly bioethanol, plants. Of course, the more money is invested in transport infrastructure to bring bioethanol from the American heartland to the coastal demand centres, where the majority of transport fuel is consumed — the harder it will be, politically, to eliminate the tariff that keeps cheaper, imported, bioethanol from being delivered directly to these areas by ship. For **wood pellets**, further growth of transport of wood pellets from the hinterland of British Columbia to the Ports of Vancouver and Prince Rupert by train may be seriously hampered by limited logistical infrastructure (e.g. single rail tracks).

The **lack of significant volumes of biomass** can also hamper logistics. In order to achieve low costs, large volumes need to be shipped on a regular basis. Only if this can be assured, there will be forthcoming investment on the supply side (e.g. new biomass pellet factories) at this will reduce costs per tonne significantly through economies of scale. The **bulky nature of biomass fuels and the relatively low value per unit would restrict availability of suitable areas for handling these fuels in busy ports**. On the other hand, this bulky nature in combination with high demand for specific biomass streams means that the present capacity (incl. storage, handling equipment, etc.) of

[7] This section is largely based on Junginger et al. (2006).

some harbors (e.g. Stockholm, Gothenburg, Immingham, several harbors in the Baltic States) is fully utilized. A further increase in biomass handling would require specific investment.

4.5.2. Survey results

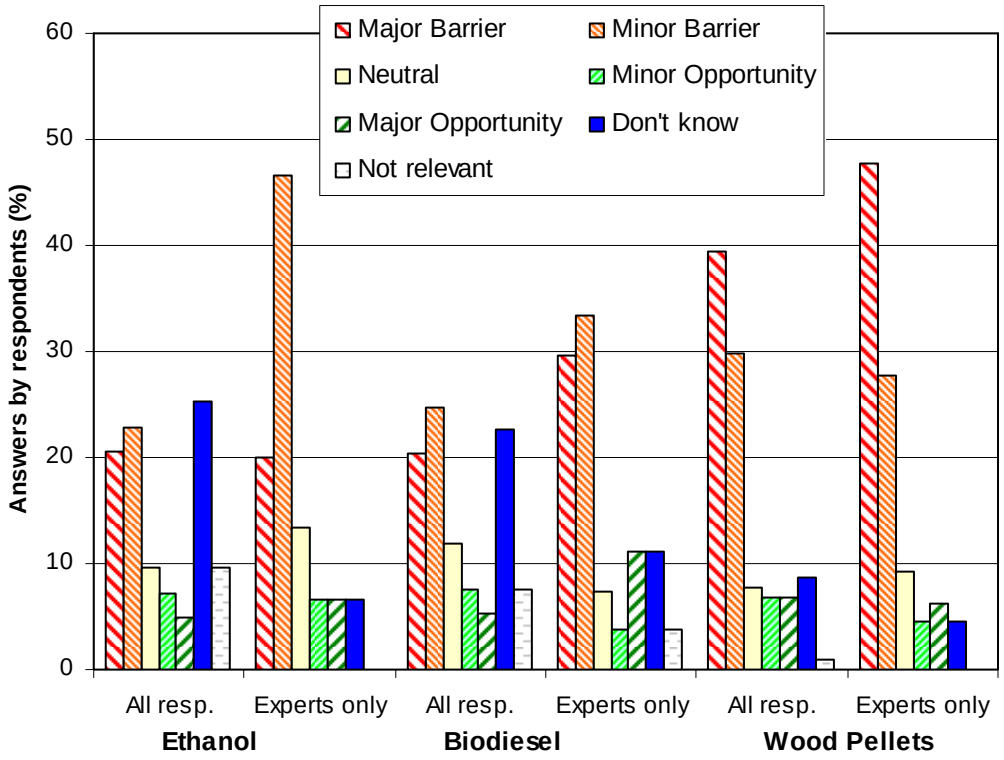

Figure 7. Overview of questionnaire responses on logistical barriers.

The respondents were asked how important logistical barriers are for the development of international bioenergy trade. As a first remark, many respondents pointed out that logistics are just a challenge, which has to be met for any commodity. Nevertheless, compared to all other trade barriers discussed so far, logistic barriers are the largest for wood pellets, with 75% of all experts considering them a major or at least minor hurdle (see figure 7). Logistics were also seen by 40-45 respondents as a barrier for liquid biofuels, though in the comments, respondents remarked that this was mainly the case for the supply-side, i.e. in many developing countries, such as South Africa and Indonesia. Bad roads, and insufficiently developed port infrastructure may be the prime reasons why exports of biofuels are commercially not viable at the moment.

As a general observation for wood pellets was that many port facilities are designed of the import of high value goods and bulk commodities such as coal. Sensitive material (e.g. wood pellets) have a lower value, and are difficult to handle and manage without proper infrastructure. In addition, the safety aspect may also play an increasingly important role. A Dutch trader mentioned that “permits for storage of wood pellets are for e.g. the Rotterdam area very difficult to obtain, which seriously limits large-scale use of wood pellets.”

4.6 Sanitary and phytosanitary measures

4.6.1 Literature review

For **liquid biofuels**, final products may face sanitary and phytosanitary (SPS) measures or technical regulations applied at borders. SPS measures mainly affect feedstocks which, because of their biological origin, can carry pests or pathogens. One of the most common forms of SPS measure is a limit on pesticide residues. Even though pesticide residues are regulated mainly to ensure the safety of food and beverages, and are much less of a problem in biofuels feedstocks that will undergo thermal or chemical processing, customs agents nonetheless may have no other choice than to apply the same regulations to vegetative biofuel feedstocks as to crops destined for human or animal consumption, especially if they have no way of determining the product's end use. Meeting pesticide residue limits is usually not difficult, but on occasion has led to the rejection of imported shipments of crop products, especially from developing countries (Steenblik, 2007). For **wood pellets** no sanitary and phytosanitary measures have been found. But for example undebarked untreated round wood and chips from outside Europe are (with a few exceptions) not allowed and are inspected thoroughly for import into the EU (see also Heinimö and Alakangas, 2006). Similarly, agricultural residues which could be used either as fodder or for production of heat and electricity may currently be denied entry if they do not meet certain fodder requirements. These kind of practices may be avoided when adequate technical/sustainability standards are in place.

4.6.2 Survey results

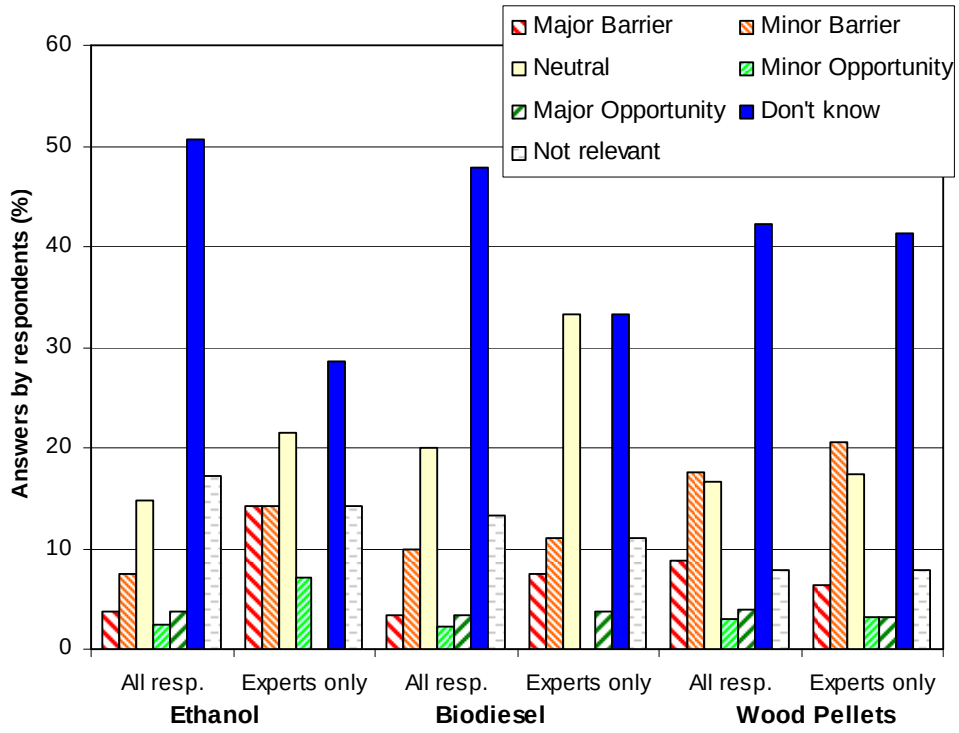

Figure 8 Overview of questionnaire responses on phytosanitary measures

The respondents were asked whether SPS measures were a barrier to bioenergy trade. Perhaps the most striking observation from figure 8 is that most respondents (including the experts) indicated that they did not know about any phytosanitary measures. This illustrates that for the three selected commodities, phytosanitary measures are not a barrier. Several respondents remarked that SPS in some cases may actually present an opportunity (e.g. for feedstocks that are unsuitable for the food

chain to be converted into biofuel), and that in some cases raw materials (e.g jatropha seeds for biodiesel, or wood chips for wood pellet production) do face SPS measures.

4.7 Lack of global classification and clear bioenergy trade statistics

4.7.1 Literature review

A fundamental problem is that for many bioenergy carriers, several end-uses are possible, and thus it is hard to determine how much exactly is traded for energy purposes. Biomass commodities traded almost exclusively for energy end-uses are ETBE (bioethanol), FAMAE (biodiesel or solvent), fuelwood and charcoal. These commodities have their own HS-codes, and therefore their trade can be monitored rather straightforward. Categorizing new bioenergy commodities (such as pyrolysis oil, pellets from various agricultural residues, torrefied pellets etc) are challenges for the future. Especially problematic are agricultural commodities like cereals and oilseeds, animal or vegetal fats and oils (e.g. palm oil), which can all serve as feedstock for biofuel[8]. Thus, it is practically impossible to determine how much is traded of energy purposes, and estimates have to rely on crude assumptions and interviews with market parties.

Furthermore, the lack of a clear classification for biofuels within the harmonized system (HS) is another key factor restricting global trade. Import standards vary from country to country and there is no consensus yet whether (liquid) biomass fuels should be considered as an agricultural or industrial good. Trade classification has important implications for countries' tariff reduction commitments as well as the national support schemes they can apply (EurActiv, 2009). Oosterveer and Mol (2010) underline that the WTO has not yet developed specific disciplines on trade in energy goods and therefore only the general WTO rules are applicable. They explain that the specific problem to determine the trade regime for biofuels concerns their classification. Bioethanol, which is considered an agricultural good, falls under the Agreement on Agriculture (AoA), while biodiesel is classified as an industrial good and falls subsequently under GATT.

Wood pellets are currently not included as separate category in the HS system, but fall under wood wastes. The joint UNECE / FAO working party on forest economics and statistics and other bodies have pointed out the need for some changes to the HS in order to show the role of wood in energy supply. The next revision of the HS is scheduled to be implemented on 1 January 2012. The Inter secretariat Working Group (IWG) on forest sector statistics (FAO, Eurostat, ITTO) will attempt to have wood pellets added to the HS 2012 revisions (UNECE Secretariat, 2008). In the EU, since the 1st of January 2009, official export and import figures on pellets are published by Eurostat using the product code “44.01.3020”, defined as “sawdust and wood waste and scrap, agglomerated in pellets” (Sikkema et al., 2009).

[8] This raises the question whether trading of raw feedstocks (e.g. palm oil) should at all be considered ‘bioenergy’ trade. If oil imported from Malaysia to the Netherlands, and then converted to biodiesel in the Rotterdam harbor, this will be counted as ‘domestic’ production of biodiesel. However, from an energy point of view, over 90% of the energy embodied in the biodiesel was produced abroad (i.e. the carbon was fixed from the atmosphere in Malaysia).

4.7.2. Survey results

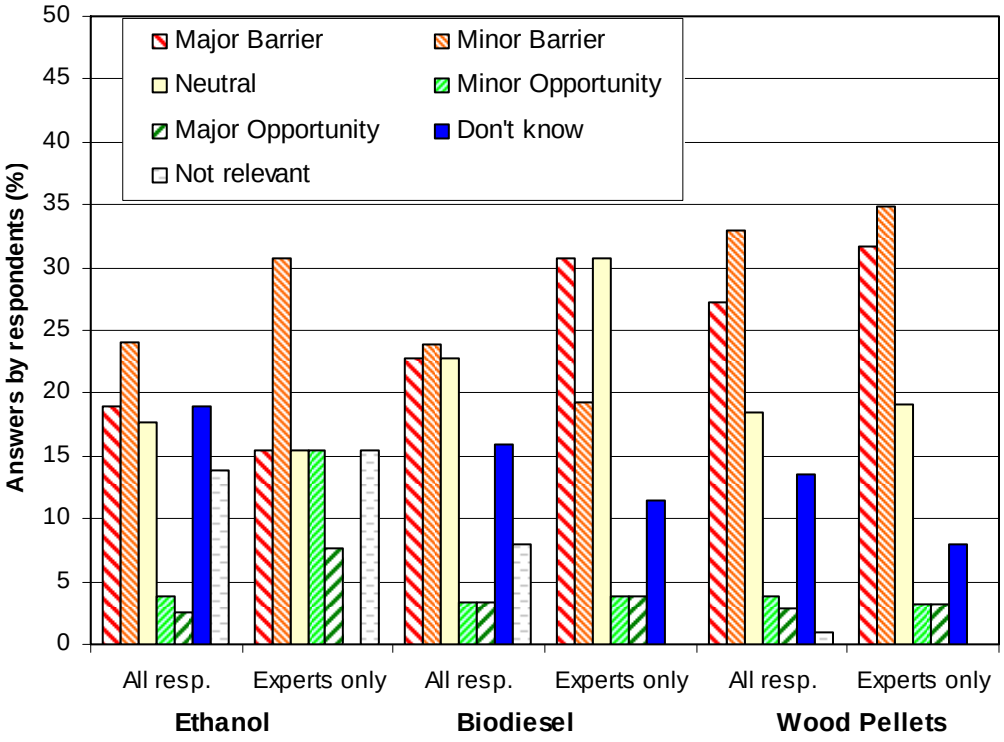

Figure 9. Overview of questionnaire responses on lack of global classification and clear bioenergy trade statistics.

As shown in figure 9, the issue of lacking statistics was only considered a minor issue for ethanol (for which indeed general statistics exist), a somewhat bigger issue for biodiesel, and a major issue for wood pellets.

Specifically for biodiesel, the EBB pointed out that until "2008, there was no specific CN code at EU level for biodiesel imports. This made the tracking of biodiesel imports before 2007 rather difficult. Now that a specific CN code 3824 90 91 has been provided to cover imports of biodiesel (FAME), there is still a concern that some traders may still continue to use the residual code 3824 90 97 when entering biodiesel in the EC, notably to circumvent the EU duties on US biodiesel. More generally, the EBB pointed out that current customs definition/classification of biodiesel (on EU or World Customs Organization level) covers only currently traded biodiesel ("fatty acid methyl ester"). Next generation biodiesel technologies (e.g. Fischer-Tropsch Fuels) remain classified in chapter 27 of the harmonized nomenclature. It seems particularly important that future negotiations on biodiesel customs classification takes into account the latest technological developments (also for instance algae biodiesel) and promotes a classification/definition that takes full account of these different fuels.

For wood pellets, several respondents pointed out that the lack of decent statistics on production, trade and consumption makes investment decisions riskier, will limit capital flows, and it will become difficult to continue to develop policies for increased production and use of bioenergy in competition with other renewable energy sources. Other market actors however pointed out that market intransparencies may on the short term also create opportunities for trade.

4.8 Other barriers

4.8.1. WTO developments

One issue not discussed so far are world trade regulations and their (possible) impact on biomass trade for energy – both positive and negative. This is of course linked to (the removal of) tariff barriers, but also to the introduction of sustainability criteria for biomass.

In the past years, Brazil was pushing hard under the (currently stalled) 'Doha Round' of multilateral trade negotiations to get biofuels classified as an environmental good. This would have qualified it for an accelerated phase-out of tariffs. On the other hand, a joint EU-US proposal to fully eliminate tariffs on a list of 43 products identified as "environmentally friendly" by the World Bank, including solar panels and wind turbines, does not include biofuels (EurActiv, 2009). To justify the exclusion of ethanol from their joint proposal, the United States and the EC have argued that trade liberalization in ethanol should be negotiated as part of the separate WTO market access negotiations for agricultural goods.

One argument put forward by the EU and the US is that in the context of constantly changing technology, they must take into account the question of "relativity" of green products – the so-called "clean vs. cleaner" debate. What may seem environmentally-friendly now may not be perceived in the same way in five years' time. The concern is that if tariffs are fully eliminated on relatively green products such as bioethanol, cleaner technologies that become available in the future, such as second generation biofuels made from non-food, woody crops, will lose the possibility of enjoying additional trade advantages. But Brazil and other bioethanol exporting developing nations, including Pakistan and Egypt, say the EU and US are merely being protectionist and attempting to put their own producers at an advantage (EurActiv, 2009).

The debate is linked to another key question that will need tackling: Whether different types of biofuels should be considered as "like products" or not, seeing as they present different benefits and flaws in terms of greenhouse gas reductions, energy efficiency and sustainability.

While the most favoured nation (MFN) principle incorporated into GATT article I requires equal treatment among different countries, the national treatment obligation incorporated into GATT article III requires the treatment of imported goods, once they have entered the country and cleared customs, to be no worse than for domestically-produced “like” goods, especially in regard of internal taxes and regulations. MFN and National Treatment make together the “non discrimination” principle. Based on the principle of "non discrimination", WTO law demands that its members apply the same tariff rates and the same taxes and regulations to all imports of products that are close substitutes of domestic products, regardless of their country of origin. Countries that do not respect these principles are liable to legal action in the WTO (EurAvtiv, 2009, van Dam et al. 2008). The legitimacy of product differentiation based on how goods have been manufactured and on their impact through the life cycle is still an open issue under WTO rules (Zarrilli, 2008).

4.8.2 Other barriers mentioned by questionnaire respondents

Next to the barriers discussed in the previous sections, respondents also had the opportunity to point out additional barriers (see appendix 7 for all answers). Many of these comments were related to the barriers already addressed earlier in the questionnaire, e.g. logistical issues, the danger of multiple and fragmented sustainability certification systems, and policies protecting national markets. A few respondents raised also the following concerns:

- Local control of export transactions by large multi-nationals, limiting exports of small-scale producers as they have to abide to the multinationals' export regulations and restrictions.
- Difficulties to find buyers and sellers of biomass, as these markets are often still very immature
- Improving the physical properties of biomass (e.g. through torrefaction) to improve handling and long-distance shipping
- Increasing administrative burdens and institutional barriers
- Lack of transparent wood pellet prices
- Many wood pellet market actors remarked that varying subsidy schemes in different countries create “artificial” and unstable trade flows and an unlevel playing field

Furthermore, as a final remark, a few respondents stated that they believed in “local for local”, i.e. that biomass should first and foremost produced be before any biomass imported (possibly even if available at lower costs). To achieve this some proposed that policies should in first instance stimulate local production before any support is given to imported biomass.

4.9 Opportunities for biomass trade

After the extensive effort to obtain an overview of barriers for bioenergy trade, last but not least, respondents were also asked what they thought to be the biggest opportunities and drivers for international bioenergytrade. The results are shown in figure 10.

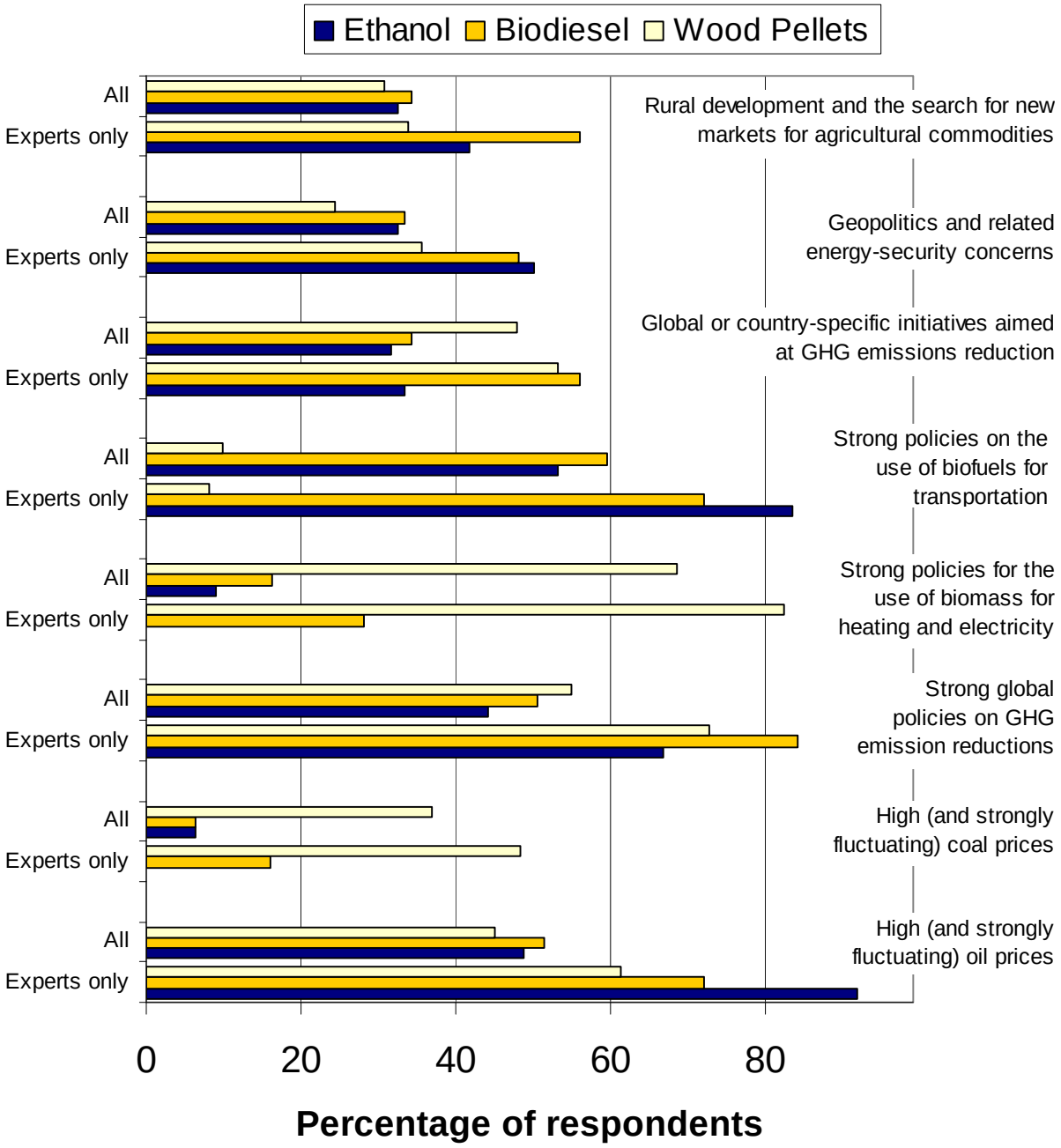

Figure 10. Opportunities for Bioenergy trade.

As shown in figure 10, high oil prices and strong GHG emission reduction policies are most important for all commodities investigated. Not surprisingly, high coal prices were only seen an opportunity for wood pellets (as about half of the global wood pellet production is used to replace coal in power plants). However, the importance of coal prices for wood pellet trade was deemed less

of an opportunity (only 50% of the experts thought so) compared to high oil prices as driver for biodiesel (more than 70%) and especially ethanol (more than 90%).

Strong policy support for liquid biofuels (for ethanol and biodiesel) and for electricity and heat from biomass (for pellets) was also deemed very important conditions for further growth of international bioenergy trade. Global or country-specific initiatives (not initiated by governments) aimed at GHG emissions reduction were deemed less important drivers for biomass trade.

Also energy-security concerns, rural development and the search for new markets for agricultural commodities were only seen as minor drivers. The geopolitical concerns were deemed more important drivers for ethanol and biodiesel import (as coal is less of concern for the security of supply than oil). Rural development were seen as the largest opportunity for biodiesel (probably because of the small-scale initiatives to produce it from small-scale Jatropha plantations), and again the least for wood pellets.

Also somewhat remarkable is the fact that the experts are in almost all cases more optimistic on the opportunities for "their" commodity than the average of all respondents. In the case of high oil prices as driver for ethanol trade, this difference is 90% for ethanol experts vs. 50% for all respondents.

Next to these opportunities, respondents were also asked whether they saw any other factors that might create opportunities for increasing biomass trade (see appendix 8). Answers partially overlapped with the opportunities above (e.g. strong policies on GHG emission reduction and support schemes for electricity, heat and transport fuels were frequently mentioned). Other opportunities were:

- High prices for natural gas (in addition to oil and coal)
- Using biomass from new areas with abundant feedstock reserves (e.g. Russia, Africa, Latin America and Australia)
- Payment for ecosystem services (of which biomass could be one)
- (Hopefully) lower shipping costs

5. Discussion and conclusions

5.1. Discussion of the questionnaire response

With 141 participants, the overall number of respondents was somewhat lower than originally anticipated, yet sufficient to identify trends and draw significant conclusions. More than 50% of the respondents worked in the industry, and the remainder of respondents was divided over NGO's, academia, governments and other backgrounds, which is a good precondition to obtain views from different angles. Wood pellet experts constituted the largest expert group with 70 experts, followed by smaller groups of biodiesel and ethanol experts. The smallest group (18 respondents) indicated that they only had general knowledge. It has to be pointed out that all respondents were free to qualify themselves as experts, while we had no means to check their actual level of expertise. However, from the many additional comments and explanations, it became clear that many of the respondents had in-depth knowledge of the topics.

The geographical coverage was not ideal, as more than two thirds of all respondents were based in Europe. This was somewhat expected, as the questionnaire was disseminated mainly through the network of the Task 40 members (of which 10 are situated in Europe). We attempted to compensate for this by sending the invitation to the questionnaire to another 1000 recipients, of which a significant part was also in Latin America, Asia and Africa (we aimed for 80% market coverage of biomass producers and traders for each region), but the response was relatively low. This may partially be due to the fact that the questionnaire was only in English, and could only be completed over using the internet. Thus, there is a chance that the views of (mainly exporting) countries in Latin America, Asia and Africa are underrepresented. Where possible, we did include the views of respondents from these areas in the discussion of each barrier.

5.2. Main barriers and drivers identified for international bioenergy trade

As a first and general observation, it was clear from the start that biomass commodities are rather heterogeneous in terms of production methods, chemical and physical composition and final end use, and thus barriers and drivers for their use and trade vary significantly. Yet, a number of general barriers and opportunities for bioenergy trade were identified.

Regarding *import or export tariffs*, tariffs for ethanol have been established for many years, while for biodiesel, these have only emerged fairly recently (examples are Argentinean export tariffs for biodiesel and the EU import tariff for biodiesel from the USA). In the RED, the EC states that it aims to meet the European biofuels targets using a combination of domestic production and imports of biofuels, and to this end, will propose "relevant measures to achieve a balanced approach between domestic production and imports, taking into account, inter alia, the development of multilateral and bilateral trade negotiations, environmental, social and economic considerations, and the security of energy supply." With the increasing production volumes in South-East Asia, Latin America, the US and the EU, it is possible that trade volumes from producers in developing countries may further increase, which may lead to further competition with domestic European producers. This could lead to further escalating trade conflicts – for example the EBB is currently investigating the possibilities for further actions against Argentina's differential export tax (EBB, 2009b). Instead, we would recommend that policy makers from the major producing and consuming regions in developing and developed countries explore the possibilities for joint international trade agreements to enable

developing countries to produce biofuels for export, and to allow developed countries to meet their bioenergy (and renewable energy) targets.

As solid biomass is today mainly destined to produce renewable electricity and heat (which can also be produced by many other technologies), the chances seem smaller that tariff barriers are introduced for solid biomass commodities, although indirect effects (such as the export tariff of Russian raw wood to Finland and the Baltic states) may still have an impact. Another important aspect is that so far, solid biomass is mainly based on by- and waste products from agriculture and forestry, while liquid biomass have a higher value and are almost exclusively produced from food and fodder crops.

Regarding the introduction of *technical standards*, the overall impression we received from respondents is that the advantages outweigh the disadvantages – this was especially the case for wood pellets. The advantages of a uniform product were deemed high. The fear that technical standards might be used to ban especially biodiesel based on soy or palm oil from European markets was not a major concern of the respondents, as large amounts soy-based biodiesel have been imported to the EU in past years. Thus, overall, the introduction of technical standards should probably be seen as an opportunity rather than a barrier. The fact that already the major producing regions have started to compare (and possibly align) there technical standards for ethanol and biodiesel is a sign that international policy cooperation may lead to new opportunities for international bioenergy trade. For the future, we recommend that policy makers anticipate the development of new bioenergy commodities (such as Fischer-Tropsch diesel or torrefied biomass pellets) and recognize the necessity to (timely) develop technical standards for them, and to include them in global trade statistics.

Regarding the impact of *sustainability criteria*, respondents clearly recognized that there is a need to substantiate the sustainable production of (especially liquid) biofuels. On the other hand, many respondents mentioned that there is so far no consensus on what should be considered sustainable production, and how this should be certified. In the end, it will probably depend on whether one (or a few) systems will become generally accepted, and whether these systems are workable and affordable. However, if the current mushrooming of new initiatives continues, it will likely become a burden for international trade rather than a stimulant. Again, a dialogue of policy makers from the EU, US and major producing regions to come to internationally accepted (minimal) sustainability requirements for liquid (and possibly also solid) bioenergy commodities could create new opportunities for sustainable bioenergy trade. The views of European stakeholders towards such a harmonized system are further described in Van Dam and Junginger (2010).

As pointed out by some respondents, *logistics* are “just another issue that every commodity faces”, and in that sense not especially related to biomass commodities. However, in particular solid biomass commodities are often characterized by a low energy density and a relatively low value, and they have to be handled with care. This makes the costs for logistics sometimes higher than the production costs of the biomass delivered at the farm/factory gate, and can thus be a prohibitive factor for international trade. While policy makers may play a role in overcoming logistical obstacles (e.g. by building better roads and other infrastructure), dedicated investments for e.g. wood pellet handling equipment will probably have to come largely from the industry itself.

Regarding other barriers, *phytosanitary measures* were not deemed an issue for the three commodities investigated in this study, but it is likely a major issue for wood chips and other untreated solid biomass, requiring more detailed investigation in the future.

Finally, concerning the *main drivers for bioenergy trade*, the obvious most important factors were fossil fuel prices (especially oil prices) and policy support, which can be subdivided in support for

renewable electricity, heat and transport fuels, and strict policies to curb GHG emissions. With on the one hand a weak result in Copenhagen, and on the other hand again increasing oil prices since the beginning of 2009, it remains to be seen how much they will stimulate the further growth of international bioenergy trade.

In summary, we conclude that there are serious issues limiting further growth of each of the commodities investigated. Interestingly, the main drivers for trade of all commodities are basically the same (climate change and policy support for bioenergy). However, the main barriers are often commodity dependent, which can be explained given the different geographical production regions, physical properties and (end-) uses. Thus, for some of the barriers, specific actions will be required by market parties and policy makers. As pointed out above, import tariffs for biofuels could be reduced or abolished, linked to multi-national trade agreements and harmonization (including provisions on technical standards and sustainability requirements) which might provide the necessary preconditions for further sustained growth of international bioenergy trade.

5.3. Acknowledgements and disclaimer

We would like to thank all survey participants for their time and effort, and the support from all Task 40 members.

This report was written for IEA Bioenergy Task 40. The issues, positions, and strategies described are those of the authors, and are not necessarily those of all members of IEA Bioenergy Task 40, nor of the members of the IEA Bioenergy Executive Committee.

Literature list

Bradley, D., Diesenreiter, F., Wild, M., Tromborg, E. (2009), World Biofuel Shipping Study, for IEA Bioenergy Task 40, 38 p., available at http://www.bioenergytrade.org

CARD, (2008) Splashing and Dashing Biodiesel, Centre for Agricultural and Rural Development, available at http://www.card.iastate.edu/iowa_ag_review/fall_08/article3.aspx

Cherubini, F., Bird, N.D., Cowie, A., Jungmeier, G., Schlamadinger, B., Woess-Gallasch, S. (2009). Energy- and greenhouse gas-based LCA of biofuel and bioenergy systems: key issues, ranges and recommendations. Resources, Conservation and Recycling, **53**, 8, 434-447.

CEN (2010). Website http://www.cen.eu, last accessed 05.02.210.

Desplechin, E., 2007. Customs inconsistencies destabilise European bioethanol industry, International bioethanol association, available at: http://www.industrial-ethanol.org/uploads/IEA%20Biofuels%20Article%20Nov%2007.pdf

Doornbosch, R., and R. Steenblik (2007) "Biofuels: Is the Cure Worse than the Disease?" In *OECD Round Table on Sustainable Development.* 2007, Paris. Available at: http://www.oecd.org/dataoecd/15/46/39348696.pdf

de Wit, M., Faaij, A. (2009). European biomass resource potential and costs. Biomass and Bioenergy (2009), doi:10.1016/j.biombioe.2009.07.011.

Drax (2009) Sustainability Policy for Biomass, available at: http://www.draxpower.com/biomass/sustainability_policy/

Dufey A., (2007) International trade in biofuels: Good for development? And good for environment? International Institute for Environment and Development, 2007, available at www.iied.org

EBB, (2008), "Statistics. the EU biodiesel industry", European Biodiesel Board, 2008-03-28, http://www.ebb-eu.org/stats.php#.

EBB (2009a) EBB priorities for 2010: undistorted international trade and implementation of EU sustainability rules, European Biodiesel Board, Press release, 26 November 2009, Available at: http://www.ebb-eu.org/EBBpressreleases/PR%20Outcome%20of%202009%20EBB%20General%20Assembly%2020091126.pdf

EBB (2009b) Restoring a level-playing field with Argentine biodiesel producers. European Biodiesel Board, Press release, 18 December 2009, available at: http://www.ebb-eu.org/EBBpressreleases/Restoring%20Level%20Playing%20Field%20with%20Argentine%20biodiesel%20producers.pdf

EBB (2009c) 2008-2009: EU biodiesel industry shows resilience amid unfair international competition and degraded market conditions EBB publishes annual biodiesel production and capacities statistics. European Biodiesel Board, Press release, July 15th, 2009, Available at: http://www.ebb-eu.org/EBBpressreleases/EBB%20press%20release%202008%20prod%202009%20cap%20FINAL.pdf

Euractiv (2009), Dossier Biofuels, Trade and Sustainability, Last update 29 July 2009. Available at: http://www.euractiv.com/en/trade/biofuels-trade-sustainability/article-171834

European Commission (2009) Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32009L0028:EN:NOT

European Commission (2010) The Commission's report on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling. Available at: http://ec.europa.eu/energy/renewables/transparency_platform/transparency_platform_en.htm

EurObserv'ER (2009). Biofuels barometer. Systèmes Solaires, le Journal des energies renouvelables, 192, available at http:// www.energies-renouvelables.org, 08.01.2010.

FAPRI (2009). FAPRI 2009: U.S. and World agricultural outlook. FAPRI Staff Report 09-FSR 1, ISSN 1534-4533, Food and Agricultural Policy Research Institute. Iowa State University, University of Missouri-Columbia, 411 p., available at http://www.fapri.iastate.edu, 15.01.2010.

FO Licht. World Ethanol & Biofuels Report 2006; various issues.

FO Licht, 2008, Changing the Climate: Ethanol Industry Outlook 2008" (PDF). Renewable Fuels Association. Retrieved on 2008-05-10.

Frombo, F., Minciardi, R., Robba, M., Rosso, F., Sacile, R. (2009). Planning woody biomass logistics for energy production: A strategic decision model. Biomass and Bioenergy, **33**, 3, 372-383.

Hamelinck, C., Suurs, R., Faaij, A. (2005). International bioenergy transport costs and energy balance. Biomass and Bioenergy, **29**, 2, 114-134.

Heinimö, J. (2008) Country report of Finland 2008, for IEA BIOENERGY TASK 40 "Sustainable International Bioenergy Trade: Securing supply and demand", August 2008, available at www.bioenergytrade.org

Heinimö, J., Junginger, M. (2009). Production and trading of biomass for energy – An overview of the global status. Biomass and Bioenergy, **33**, 9, 1310-1320.

HGCA, 2008. Biodiesel 'Splash and Dash', press release 8 October 2008, Available at: http://www.hgca.com/content.output/3629/3629/Markets/Market%20News/Biodiesel%20%27Splash%20and%20Dash%27%20.mspx

ISO (2010). ISO standard to make bioenergy sustainable, Press release 07.01.2010, available at http://www.iso.org, 05.02.2010.

ITA (2008), Fact Sheet - Milestone Achieved in Advancing Global Use of Biofuels. International Trade Administration. Available at: http://www.trade.gov/td/standards/Biofuels/biofuels_report_fact_sheet.pdf

Jank, Marcos, Géraldine Kutas, Luiz Fernando do Amaral and André M. Nassar (2007),"EU and U.S. Policies on Biofuels: Potential Impacts on Developing Countries", German Marshall Fund of the United States, Washington, D.C.

Junginger, M. Faaij, A., van den Broek, R., Koopmans, A., Hulscher, W. (2001) Fuel supply strategies for large-scale bio-energy projects in developing countries. Electricity generation from agricultural and forest residues in Northeastern Thailand. Biomass and Bioenergy 21 (4), pp. 259-275.

Junginger, M., Faaij, A., Schouwenberg, P.P., Arthers, C., Bradley, D., Best, G., Heinimö, J., Hektor, B., Horstink, P., Grassi, A., Kwant, K., Leistad, O., Ling, E., Peksa, M., Ranta, T., Rosillo-Calle, F., Ryckmans, Y., Wagener, M., Walter, A., Woods, J., (2006), Opportunities and barriers for sustainable international bioenergy trade and strategies to overcome them. IEA Bioenergy Task 40, November 2006.

Koplow D. (2007) "Biofuels: At What Cost? Government Support for Ethanol and Biodiesel in the United States." Global Subsidies Initiative of the International Institute for Sustainable Development, Geneva, available at: http://www.globalsubsidies.org/files/assets/Brochure_-_US_Update.pdf

Koplow, D. A, (2009) Boon to Bad Biofuels. Washington: Earth Track and Friends of the Earth. 2009,available at: http://www.foe.org/sites/default/files/FOE%20VEETC%20Evaluation%20FINAL.pdf

Ladanai S., Vinterbäck J. (2009). Global Potential of Sustainable Biomass for Energy. Report 013, Uppsala, Swedish University of Agricultural Sciences, Department of Energy and Technology, 30 p.

Lane, J. 2008. Statement by Renergie on the bioethanol Tariff, Biofuels digest, 8 august 2008, available at: http://biofuelsdigest.com/blog2/2008/08/05/statement-by-renergie-on-the-ethanol-tariff/

Londo, M., Lensink, S., Wakker, A., Fischer, G., Prieler, S., van Velthuizen, H., de Wit, M., Faaij, A., Junginger, M., Berndes, G., Hansson, J., Egeskog, A., Duer, H., Lundbaek, J., Wisniewski, G., Kupczyk, A., Könighofer, K. (2010). The REFUEL EU road map for biofuels in transport: Application of the project's tools to some short-term policy issues. Biomass and Bioenergy 34 (2), pp. 244-250, doi:10.1016/j.biombioe.2009.07.005.

Magelli, F., Boucher, K., Bi, H.T., Melin, S., Bonoli, A. (2009). An environmental impact assessment of exported wood pellets from Canada to Europe. Biomass and Bioenergy, **33**, 3, 434-441.

Marchal, D., Van Stappen, F., Schenkel, Y. (2009). Sustainable production criteria and indicators for solid biofuels. Biotechnol. Agron. Soc. Environ., **13**, 1, 165-176.

Martinot, E., Sawin, J.L. (Lead Authors) (2009). Renewables Global Status Report: 2009 Update. REN21 (Renewable Energy Policy Network for the 21st Century), 31 p., available at http://www.ren21.net, 08.01.2010.

MPOC (2009) Joint Plan to File Case Against EU Palm Oil Directive, Press release, 10 December 2009, available at: http://mpoc.org.my/Joint_Plan_to_File_Case_Against_EU_Palm_Oil_Directive.aspx

Murphy, s. (2008), The multilateral trade and investment context for biofuels: Issues and challenges. Institute for Agriculture and Trade policy (IATP), April 2008. Available at: http://www.tradeobservatory.org/library.cfm?refID=102282

NBB, (2008) "US Biodiesel Demand" (PDF), Biodiesel: The official site of the National Biodiesel Board.

Oosterveer, P., Mol, A.P.J. (2010). Biofuels, trade and sustainability: a review of perspectives for developing countries. Biofuels, Bioprod. Bioref., **4**, 66-76.

RFA (2009). Growing innovation, 2009 Ethanol Industry outlook. Renewable Fuels Association, 33 p., available at http://www.ethanolRFA.org, 08.01.2010.

Rosillo-Calle, F, Walter, A. (2006) Global market for bioethanol: historical trends and future prospects. Energy for Sustainable Development 2006; X(1): 18-30.

Ryckmans, Y., Marchal, D., André, N. (2006). Energy balance and greenhouse gas emission of the whole supply chain for the import of wood pellets to power plants in Belgium. In: Proceedings of the 2nd World conference on pellets, May 30 – June 1, 2006, Jönköping, Sweden, 127-130.

Sikkema, R., Steiner, M., Junginger, M., Hiegl, W. (2009). Development and promotion of a transparent European Pellets Market. Creation of a European real-time Pellets Atlas. Final report on producers, traders and consumers of wood pellets. Deliverable 4.1/4.2/4.3 for the Pellets@las project, 91 p., available at http://www.pelletsatlas.info, 15.01.2010.

Sikkema, R., Junginger, H.M., Pichler, W., Hayes, S.., Faaij, A.P.C. (2010), The international logistics of wood pellets for heating and power production in Europe; Costs, energy-input and greenhouse gas (GHG) balances of pellet consumption in Italy, Sweden and the Netherlands. Biofuels, Bioproducts and Biorefining, 4 (2) pp. 132-153. doi: 10.1002/bbb.208.

Sikkema, R., Faaij, A., Ranta, T., Gerasimov, YY., Heinimo, J., Asikainen, A., Nabuurs, G.J., (2010) Sustainable bioenergy from boreal forests in Finland and Russia with different forest management regimes. Forest Policy and Economics, Accepted for publication.

Smeets, E., Junginger, M., Faaij, A., Walter, A., Dolzan, P., (2008) The sustainability of Brazilian ethanol - An assessment of the possibilities for certified production. Biomass & Bioenergy, 32(8) pp. 781-813, doi:10.1016/j.biombioe.2008.01.005

Smeets, E.M.W, Faaij, A.P.C., (2010) The impact of sustainability criteria on the costs and potentials of bioenergy production – Applied for case studies in Brazil and Ukraine biomass and bioenergy 34, pp. 319 – 333.

Spelter, H. and Toth, D. (2009) North America's Wood Pellet Sector. Research Paper FPL-RP-656. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 21 p., September 2009.

Steenblik, R., 2007, Subsidies: the distorted economics of biofuels, Discussion paper No. 2007-3, December 2007. The Global Subsidies Initiative (GSI), International Institute for Sustainable development (IISD), Geneva, Switzerland.

Taylor, J. (2009) Latin American biodiesel is booming as a result of domestic demand, as well as a healthy export market, as Europe slaps duties on the US, ICIS chemical business, 30 October 2009, available at: http://www.icis.com/Articles/2009/11/02/9258980/latin-american-biodiesel-market-surges-as-europe-slaps-us-with.html accessed May 5th 2010.

Tripartite Task Force (2007) White paper on internationally compatible biofuel standards. Tripartite Task Force: Brazil, European Union and United States of America. p. 94. Available at: http://ec.europa.eu/energy/res/biofuels_standards/doc/white_paper_icbs_final.pdf

De la Torre Ugarte, D. (2008) Opportunities and challenges of biofuels for the agricultural sector and the future security of developing countries, UNCTAD/DITC/TED/2007/5).

UNECE Secretariat (2008). Guidance of work area 1: Markets and statistics. Joint FAO UNECE Working Party on Forest Economics and Statistics, Timber Committee.

UNCTAD Secretariat (2005), "Methodologies, Classifications, Quantification and Development Impacts of Non-Tariff Barriers" (Doc. No. TD/B/COM.1/EM.27/2, 23 June 2005), paper prepared for the Expert Meeting on Methodologies, Classifications, Quantification and Development Impacts of Non-Tariff Barriers (Geneva, 5-7 September 2005), United Nations Conference on Trade and Development, Geneva.

UNCTAD (2008). UNCTAD Coding System of Trade Control Measures - TRAINS, available at http://r0.unctad.org/trains_new/tcm.shtm

van Dam, J., Junginger, M., Faaij, A., Jürgens, I., Best, G., Fritsche, U. (2008), Overview of recent developments in sustainable biomass certification, Biomass & Bioenergy, Volume 32, Issue 8, 749-780.

van Dam, J., Faaij, A., Lewandowski, I., Van Zeebroeck, B., (2009), Options of biofuel trade from Central and Eastern to Western European countries, Biomass and Bioenergy, 33(4), pp. 728-744.

van Dam, J., Junginger, M., Faaij, A.P.C. (2010) From the global efforts on certification of bioenergy towards an integrated approach based on sustainable land use planning. Submitted to Renewable and Sustainable Energy Reviews, March 2010.

van Dam, J., Junginger, M. (2010) Striving to further harmonization of sustainability criteria for bioenergy in Europe: recommendations from a stakeholder questionnaire. Manuscript in preparation, March 2010.

Wallace, P. (2008) The Commercial and Environmental Sustainability of Biomass-Fuelled Power Generation in the United Kingdom, keynote speech, IEA International Workshop "Woodfuel Supply Chain –Sharing Experience", Warwick, England 17 September 2008. Available at: http://www.biomassenergycentre.org.uk/

Walter, A., Rosillo-Calle, F., Dolzan, P., Piacente, E., Borges da Cunha, K., (2007) Market Evaluation: Fuel Ethanol, report for Task 40 Sustainable Bio-energy Trade; securing Supply and Demand, Deliverable 8. January 2007.

Zarrilli (2006) The emerging biofuels market: Regulatory, trade and development implications, UNCTAD/DITC/TED/2006/4

Zarrilli (2008) Making Certification work for sustainable Development: the case of biofuels. UNCTAD/DITC//TED/2008/1

Appendix 1 Definitions

Bioenergy - renewable energy (e.g. electricity, heat or transportation fuels) produced from the conversion of the complex carbohydrates in organic matter. Organic matter may either be used directly as a fuel or processed into liquids and gases.

Biofuels - Fuel produced directly or indirectly from biomass. In this paper, the term biofuel applies to liquid fuels (such as bioethanol or biodiesel), produced from organic (once-living) matter, and mainly intended as transportation fuel.

Biomass - Organic matter available on a renewable basis. Biomass includes forest and mill residues, agricultural crops and wastes, wood and wood wastes, animal wastes, livestock operation residues, aquatic plants, fast-growing trees and plants, and municipal and industrial wastes.

International biomass and bioenergy trade – the physical trade of biomass and biofuels intended for an energy end-use over an international border. International trade would for example include the shipment of bioethanol from Brazil to the US for blending with gasoline. It does however ***not*** include:

- ethanol that is produced from a fossil (synthetic) feedstock (such as oil or natural gas)
- international trade of ethanol for other end-uses, e.g. in beverages.
- transport of ethanol from one US-state to another (i.e. without crossing an international border)

Appendix 2 Answers by respondents on import/export tariffs

Country Code	Expertise	Please explain your choice.
GB	Ethanol	Ethanol - US and EU have tariffs that prevent free flow of trade from Brasil Biodiesel - EU major consumer ; counter-tariffs will mitigate the splash-and-dash effect
BR	Ethanol	tariffs distort markets, lower efficiency and add to costs
GB	Ethanol	I am an African student so my view is from the African perspective. Historically, i think import/export tariff constitutes a barrier especially for exporting countries. Africa has a great potential for biofuels as confirmed by various studies but still faces great challenges to realizing this huge bioenergy potential. Brazil currently produces ethanol at the least production cost. Africa for sure will need time to be as competitive in terms of production cost. Even though Africa has free trade agreement with Europe, an imposition of tariffs will further be a disincentive for producing biofuels in a region recognized to be able to produce huge amount of it thereby reducing the size of the international biofuel trade.
ZA	Ethanol	Domestic producer incentives are a very good thing to stimulate growth in national markets, however the international supply shortages are too great for these to be major barriers to trade. Having said that, I believe that every effort should be made to discourage international trade in biofuels in this early market because their export shipment emissions (from fossil fuel transport) discredit the 'green' characteristics and climate benefits of biofuels.
BR	Ethanol	The ethanol exports are very limited in major consumption markets (USA and EU) due to trade barriers. The CBI agreement, the way which Brazilian exports go to USA, doesn't make any economic or environmental sense, nor the corn ethanol program in USA. If we had a free ethanol trade we would have massive GHG savings.
ZA	Ethanol	South Africa import about 2 billion litres of petroleum products annually. I believe South Africa is net exporter of ethanol (not bio-ethanol) from the domestic coal to petroleum industry. An import tariff on bio-ethanol (oxygenates) may increase the incentives and viability of the bio-ethanol industry in South Africa. South Africa is a net export country in terms of maize - we do not have a sufficient domestic market for maize (corn). An import tariff on bio-ethanol may assist in getting the local bio-ethanol industry going favoring the production of summer grains. However, RSA policy is not in favor of tariffs - as a country we would like to see all global agricultural support (PSE) to be comparable - this will definitely promote our agriculture - subsidies in USA and EU countries lead to lower world prices.
ZA	Biodiesel	Manufacture and sell locally only
MY	Biodiesel	Inconsistent tariffs - US tariffs on PME from Malaysia but no tariffs on Indonesia and Singapore
ID	Biodiesel	For example in Indonesia to import bioethanol or biodiesel need a special license from Ministry of Trade. Also bioethanol for domestic market in Indonesia are subject to special duties of USD 1.00 per liter and 10% of VAT from selling price.
AT	Biodiesel	Importing Biodiesel substituted by other countries (like B99) is a big threat to the European Industry and is finally ecological not helpful. Renewable energies should be produced 'locally' (so at least Europe wide feedstock for Europe wide production)
AT	Biodiesel	The product get to expensive
AT	Biodiesel	It increase the Price for the consumer

IT	Biodiesel	The case of the US 'splash and dash' practice for biodiesel well explain how export subsidies might affect biofuel international trade. I think that this kind of market distortion should be avoided in order to allow a fair biofuel chain development in all different market. The EU issue to undertake a balanced approach between import and internal production of biofuel should be pursued by means of fair tariff and trade procedures and at the same time by allowing the development of national biofuels chain with a special care for sustainable local agricultural production
ML	Biodiesel	i'm working mainly in a topic of bio fuel in term of pure plant oil (PPO) using instead of Diesel in the small village in Mali. the fuel is produced and directly use in the multipurpose plat form for modern energy supply in the rural area.
ZA	Biodiesel	Exception on all taxes for 5 years for investors
AR	Biodiesel	The question is bad formulated since import and export tariffs can have two directions. My answer is regarding export taxes that are high in Argentina
DE	Biodiesel	I don´t know
ZA	Biodiesel	In South Africa (and elsewhere in Africa, according to my research) there are no tariff barriers imposed against any of the bio fuel categories in the subject matter.
MY	Biodiesel	By creating Trade Barriers through Import/Export Tariffs, the market for Biodiesel is completely distorted. More expensive and not so environment friendly sources of vegetable oils are used in preference to more cost effective and more environment friendly Biodiesel. In addition when land is scarce for cultivation high yielding crops like Oil Palm have a much better comparative advantage and should be allowed to trade in an open market without trade barriers.
US	Biodiesel	We had hoped to export US biodiesel to the EU, but the recent trade barriers put a stop to that. I have a producer in the Caribbean who may be able to export to the EU without being subject to the tariff, if I can locate a biodiesel buyer in the EU.
KE	Biodiesel	Biodiesel production in Kenya is young (in its infancy).This is because it is only 4 years old since its conception. There are no clear policies/strategies on its production, use and marketing. But a Kenya Biodiesel Development Association was formed last year, Green Africa Foundation being one of the stakeholders. This is thought to come up with clear policies, strategies and guidelines on the same.
ZM	Biodiesel	it will make the biodiesel especially that coming from the third world countries such as Africa un competitive. However considering the nature of the commodity (energy) which not all nations in the world have the potential of the developing the industry, majority of the countries will relay on imports and very few nations can afford to put imports tariffs.

BE	Biodiesel	Here, a single answer cannot be provided. On the one hand, import tariffs for biodiesel do not represent a trade barrier, especially within the EU, where only a 6,5% ad valorem duty is levied on biodiesel imports. The fact that the EU biodiesel market is not overly protected has been clearly illustrated by the surge of so called US "B99" biodiesel exports to the EU in 2007 and 2008. More than 1,05 million tonnes (2007) and almost 2 million tonnes (2008) of heavily subsidized and dumped US biodiesel were exported to the EU, until anti-dumping and countervailing measures were eventually imposed by the EU last March 12th, following the complaints lodged by EBB. On the other hand, some trade practices emerging at international level are raising major concerns in terms of fair international trade in biodiesel. This is first of all the case for the US subsidy scheme referred to as “blender’s credit” (1$/gallon = 300$/tonne) applicable to both biodiesel consumed in the US and exported outside the US. The measures adopted by the EU last March 12th (prolonged for 5 years on July 10th) are of course bringing a major relief for EU producers. These measures against US B99 were not at all a protectionist move but they merely contributed to re-establish the level-playing field that EU biodiesel producers can legitimately enjoy. Yet, it can be feared that the heavily subsidized and dumped US biodiesel will find alternative marketing opportunities, therefore disrupting biodiesel markets in other countries. EBB will therefore remain particularly vigilant against possible attempts to fraudulently circumvent the EU duties via third countries (Canada, Singapore, Mexico, Argentina…). Equally, the Differential Export Tax scheme applicable in Argentina should raise major concern, as it artificially incentives the processing of soybean oil into biodiesel, which is then massively exported outside the country. Although DETs are not per se contradicting to WTO rules, the EU has consistently promoted the banning of theses measures in the successive WTO rounds. EBB supports the EU Commission in defending this position. Finally, EBB considers that the tariff preferences currently granted under the EU Generalized System of Preferences (GSP) are particularly questionable in some cases, notably when it comes to Malaysia, Indonesia and Argentina. Under the GSP schemes, these countries are in position to export their biodiesel to the EU under a 0% duty regime. However, the GSP has always been meant to be a development tool, while Malaysia, Indonesia and Argentina are far from being developing countries when it comes to their biodiesel or vegetable oil exports. For instance, only in 2008, the EU has already imported 145 000 tonnes of palm oil biodiesel from Indonesia, some 34 000 tonnes from Malaysia and 66 000 tonnes of soybean methyl ester from Argentina. The volumes imported from these three countries are expected to strongly increase in 2009 The 0% tariff preference granted to Malaysia and Indonesia under the GSP appears all the more inconsistent, considering that the EU is since July 2009 levying a duty on the corresponding raw material coming from the very same countries (5,1% on palm oil from Malaysia and Indonesia imported under CN code 1511 90 91 10).
NO	Wood Pellets	Price and transport costs are the main barriers.
SE	Wood Pellets	Tariffs will influence trade patterns; make it more difficult to deliver from some regions and make ineffective production and export from other regions possible which otherwise would not have been possible
SE	Wood Pellets	Their is no one on wood pellets as far as I know

DK	Wood Pellets	Tariffs don't seem to be a barrier at the moment but may be in the future.
NL	Wood Pellets	Wood pellets trade volume comprises a minor part of total trade volumes and, regarding import/export tariffs, will not attract much attention from politics for the moment. Also: wood pellets are produced from by-products from other industries, so the economic impact is small in relation to dedicated production industries such as for bioethanol and biodiesel. Subsidies to promote the use of wood pellets as a fuel can however support a growth in wood pellets trade.
GB	Wood Pellets	I have not experienced any trade barriers specifically relating to wood pellets however there are many and varied costs associated with importing and exporting through ports. I can see no benefit to trade of import or export tariffs.
BE	Wood Pellets	at the moment no barriers exist for woodpellets, but this can change of course
SE	Wood Pellets	The effect should depend on whether the market is short or long. If the former, and barring significant technical or logistical issues, an import tariff should not stop the flow of imports as long as there is a market. If long, then an import tariff should kill off trade. Similarly, if a producer has little or no local market (ie: long), an export tariff will hurt the producer but not kill trade necessarily.
JP	Wood Pellets	In Japan, we don't have tariff barriers for wood pellets. For instance we have no national standards for wood pellets.
SE	Wood Pellets	Free trading should be stimulated also on energy. Otherwise we will never see the development on reducing co2 emissions. If the market is strong enough and the demand og bioenergy is increasing, why hindre it by tariffs?
CA	Wood Pellets	The market is not yet stable and set, trading biomasses and biofuels as a commodity. Tariffs would make it more difficult to get international trade developing well. We have seen it with countries like Brazil for example (ethanol).
GB	Wood Pellets	for pellet producers no import or export tariffs exist at present
GB	Wood Pellets	There are no barriers for import of product
NL	Wood Pellets	demand in several countries exceeds supply and although imported biomass is often rewarded with less support the market is there;
NL	Wood Pellets	Import/Export taxes would reduce the competitiveness of that particular area in comparison with areas that do not have this.
NL	Wood Pellets	There are no import tariffs on pellets There are different tariffs through europe for boi ethanol and biodiesel and also tax differences
NL	Wood Pellets	Imported wood pellets are common in Dutch coal fired power plants. I am not aware of any measure to stimulate the trade. And given Dutch experience, any discouraging measure (if available) surely has limited impact.
DE	Wood Pellets	Negative as disturbing effect on markets and competition
NO	Wood Pellets	No tariffs exists

NO	Wood Pellets	Tariffs (and more generally, taxes) may always be a barrier, but it depends on the level and the relative competitiveness of bioenergy production. The levels listed on the http://www.bioenergytrade.org/tariffbarriers.html seems to be low in the EU and USA.
CA	Wood Pellets	We still produce only enough ethanol and biodiesel for our own use. We have no tariff problems with pellets.
RU	Wood Pellets	There is no export tariffs for wood pellets in Russia so far
US	Wood Pellets	I think it is important to stimulate local growth and supply of these markets. tariffs on wood products may foster the use of locally grown wood pellets for energy consumption
GB	Wood Pellets	Trade barriers and protectionist tariffs are always a bad idea, harming the protected country as much as those who are protected against. But there are no significant tariff barriers at the moment to the import of wood pellets to the UK from most relevant countries.
US	Wood Pellets	We have never exported pellets, I don't know of tariffs being any hindrance.
GB	Wood Pellets	I am not trying to export and don't think this should happen for wood pellets - they should be used as close as possible to production.
US	Wood Pellets	Being in the pellet industry there are opportunities to partner with biodiesel and bioethanol plants.
US	Wood Pellets	We are currently not involved in exporting. This is more of an east-coast issue. Our manufacturing is done on the west coast of the USA
	Wood Pellets	Pellets are desperately needed in Europe any such taxes only worsens the opportunity to deliver.
SE	General expertise	In general a free market would lead to increased trade flows. The existence of import/export tariffs might increase the more local bioenergy trade.
AR	General expertise	Argentina's biodiesel industry is set up to export. German tariffs adversely and unfairly affecting trade.
EU	General expertise	Especially the development of the Flexifuel car market is strongly inhibited by the customs on sugar cane ethanol in the EU. a lower price on bioethanol would be a greater competitor to gasoline. The EU focus on not competing with European ethanol production, when the focus should be replacing imported oil products
GB	General expertise	We believe in green fuel grown locally, importing and exporting should not be high on the agenda. The main problem we find is unfair duty rebates that do not relate to the reduction of CO2 achieved. Instead of looking at what ways we can more easily import unknown so called green fuel we would be better at giving the local credible ones a leg not an even bigger disadvantage due to cheaper competition.
NL	General expertise	It all depends on the height of the tariffs. Currently, the EU has a substantial tariff on ethanol, a minor one on biodiesel and none on pellets. The significant of any tariff depends on - its height as a share of average sales prices of the material - the share of feedstock costs in total product costs (e.g. liquid fuel, electricity).
NO	General expertise	Biofuels are in general favored compared to fossil fuels.

BR	General expertise	According only few studies, only the renewable energy products has been effected by Tariff barriers why? while that, ONLY few companies, countries or investors won a LOT OF money for dirties products, like oil and its products! But they are killing our planet and the government should tax the oil products only few cents/gallon to directioned more credit to production of bio-fuels. They n=have to understand that, if more people works to produce bio-fuels, food and energy they will have more opportunities to have a job and future for their family. Also more development for the degraded region that it was made the mill for ethanol or biodiesel. Hope this is the future for medium term for the future of North Korea, Africa, India and China for fuel, home-work and eletric energy, all renevable so best is imposible! while that, every year the oil companies won billion from a addict and bad energy for the future. Good luck and God bless all!
US	General expertise	Tariffs wouldn't be sustained if they didn't help someone. If they are helping or protecting one group, then another group that would benefit from completely free trade will suffer. I think it provides opportunity for those the tariff helps while imposing a barrier on others. I think the political process can mitigate the barriers, thus, I'll judge the tariffs to be minor barriers as I only have one choice. They are also opportunities. I'm not sure that stimulating trade is the same as providing opportunities.

Appendix 3 Answers by respondents on technical standards

Country Code	Expertise	View on technical standards
GB	Ethanol	It could be a barrier but this can be overcome through effective technology transfer and cooperation.
ZA	Ethanol	International standards are necessary with or without trade because the machinery fuelled by biofuels are internationally standardized and require particular grades to be maintained. Of course this facilitates trade options but I foresee most biofuel demand to be local in the near future due to the rising cost of fossil fuels (low cost extraction is practically finished globally). I believe national governments will be inclined to protect domestic supply/production going forward.
BR	Ethanol	The EU standard for ethanol is working as a technical barrier, which also makes trade much more limited.
ZA	Ethanol	Quality is not negotiable and must be globally standardized for vehicles.
ZA	Biodiesel	Common technical grounding will level the playing field and facilitate international trade due to a common commodity being used.
MY	Biodiesel	EU & US. Some technical standards set to favour biodiesel based on local veg oils to qualify while excluding imported biodiesels based on different veg oil feedstocks. Not based on real technical requirement.
DE	Biodiesel	CEN biodiesel standard based mainly on European feedstocks
ID	Biodiesel	All standard issue by any countries e.q. ASTM (USA), EN (Europe), JIS (Japan), SNI (Indonesia), are helping buyers & sellers to have same understanding about quality of biodiesel or bioethanol they sell or buy. However develop countries must be reasonable to set a standard specifically for products from developing countries, because lack of technology and capital. Unless develop countries share the technology and investment, it will be difficult t for developing countries to produce bioethanol or biodiesel to meet international high quality standard.
AT	Biodiesel	it guarantees a constant quality
NL	Biodiesel	We are not producing biodiesel, but SVO (Straight Vegetable Oil) and press cake. This SVO can be a feedstock for biodiesel or directly as PPO (Pure Plant Oil) or in de CHP. Currently only Germany has got a standard for PPO (which is based on Rape Seed oil)
IT	Biodiesel	in the case of biodiesel standard, the amendment of the EU standard (in particular 14214) could offer the opportunity to utilize a wider range of feedstock's like soybean, sunflower and so on
ZA	Biodiesel	Our company has completed the bio fuel act for Zambia. The standards are all in place to start manufacturing. Just need investors and or technology partners/investors
AR	Biodiesel	Technical standards can easily be fulfilled by local industry
DE	Biodiesel	In Germany the technical standards are minimal.
ZA	Biodiesel	International trade depends upon the establishment and maintenance of quality standards and technical specifications. These need to be mandatory. There is currently no mandatory imposition of such standards in Africa, to the best of my knowledge.

MY	Biodiesel	If Technical standards discriminate based on source of Biodiesel based on intrinsic characteristics of vegetable oils used to produce Biodiesel then it can be used as a barrier to free trade.
US	Biodiesel	The EN standard for biodiesel (or wood pellets) is not that difficult to meet for North American producers.
ZM	Biodiesel	most of standard developed by countries are within the same specks though the EU standards are still the highest. No nation can develop the standard without looking at the existing international standards. more over even the vehicle manures have the minimum standards for certain blends which acts as a guide.
BE	Biodiesel	Technical standards regulating biodiesel quality and specifications in the different regions of the world does not represent an obstacle to trade, despite some regional differences. This has been acknowledged by the EU/US/Brazil Tripartite Task Force in its December 2007 Report on Internationally compatible biofuels standards. More specifically, the report states that “While some methods, test parameters, or parameter limit values are not currently aligned, their non-alignment may not have much of an impact if biodiesel made in one region is destined for use in another region.” (p. 24). The fact that biodiesel standards do not represent an obstacle to trade has been further evidenced by the fact that US B99 biodiesel has been massively exported to the EU in 2007 and 2008, despite some minor differences between the ASTM and EN biodiesel standards.
SE	Wood Pellets	necessary with internationally accepted standards for int´l trade
SE	Wood Pellets	For us is the current standards okay
NO	Wood Pellets	cargo classification is a major barrier, imo (international maritime org, (un)) have made it harder to ship, as it is classe as dangerous cargo
DK	Wood Pellets	There can be a great deal of uncertainty in connection with the origin and content of wood pellets. A strong and commonly used standard may help to remove this uncertainty.
NL	Wood Pellets	Traders demand standardized specifications regarding the commodities that they trade. When adequate standardization (like technical specifications) are not available, trade will restricted to Over-The-Counter transactions.
NL	Wood Pellets	Standards could increase would pellets te become a commodity and they help transparency in the market
SE	Wood Pellets	Standards for pellets can be both a minor barrier and a major advantage to international trade
GB	Wood Pellets	A common technical standard for wood pellets would greatly improve the trade in wood pellets.
BE	Wood Pellets	Large industrial users usually have their own specific standards tailored to their installations. It is probably only useful to have one common standard for pellets for domestic appliances.
SE	Wood Pellets	If there are multiple sets of standards which aren't aligned, this should hamper trade and transparency. Pockets of regional markets will do little good if there cannot be trade amongst the markets themselves. If standards are unified, then the question depends on how stringent these are. The stricter the standards, the slower the flow on production and trade in the short-run. But I suspect it would be better for the industry in the longer-run if customers are considered first and foremost.
JP	Wood Pellets	If we don't have no technical standards, consumer is not safe for buy pellets. It means we don't creat pellet market in global.

DE	Wood Pellets	For both trading purposes and use of woodpellets I think a standardization would significantly help to develop the market. For using woodpellets the major benefit might be in application for environmental permits. When there is a standard spec, governments might be more willing to grant these kind of permits.
DE	Wood Pellets	
SE	Wood Pellets	Fre trading needs a common standard - otherwise we will end up in a mess where customers will suffer and demand slowing down.
CA	Wood Pellets	Standardization is good, so people know what they are getting. For international trade, i don't know how it will be affected.
GB	Wood Pellets	Technical standards will improved confidence in the wood pellet market and should therefore increase trade
GB	Wood Pellets	in the more lucrative market of residential suuply a standard will be beneficial.
GB	Wood Pellets	Until wood pellets are understood more in the UK any standards will be of mimor importance
NL	Wood Pellets	the more unity, the better commodity
NL	Wood Pellets	The more standardized, the better. Only then the market can really develop as a 'commodity'. It will improve liquidity in the market.
NL	Wood Pellets	every customer has its own technical standart, we have to follow it.
NL	Wood Pellets	No Barriers just look at eu specifications. The amount of ethanol to be mixed with petrol is not possible in every %
NL	Wood Pellets	A predefined quality for wood pellets, makes combustion of it easier. The prechecks for the quality can be reduced, thereby making use of pellets becomes easier, and thus trade becomes easier.
DE	Wood Pellets	Major to minor barrier: if a lot of different standards are developed - harmonization of standards would be more efficient
NO	Wood Pellets	In a mature marked standards are needed in order to facilitate a efficient trade. However as markets are still in a developing stage, standards might hamper the development by blocking out opportunities.
NO	Wood Pellets	Standards reduce transaction costs (reduce the cost of information) and thereby facilitate trade.
CA	Wood Pellets	Our pellets are already seen as marketable in most if not all countries.
AT	Wood Pellets	Standards need to be a major barrier for those not fulfilling the criteria in order to build a market. Hence we do support these barriers which shall also lead to a diversification of product classes
RU	Wood Pellets	Standards are very important in the international trade, they determine the trade
US	Wood Pellets	While I am only familiar with standards regarding wood production, I do feel that if we are looking for more sustainable sources of energy, there needs to be a minimum level of environemtal standards of production. For example, the production of wood pellets for energy consumption should begin with certified forests.

GB	Wood Pellets	The standards developed for wood pellets in Austria and Sweden are unnecessarily tight (e.g. with regard to ash content), driving up costs to consumers unnecessarily. This looks likely to be corrected in the new European standards. Attempts by the UK government to regulate boiler standards are pathetically badly-run, out-of-step with European producers who have already proved the quality of their equipment, and (through their unnecessarily high cost) distort the market towards a few players who have the money to put their kit through the process. But that's just par for the course for the UK government and its quangos' interventions in standards and in the market. We'd probably be better off without a government than with the one we've got.
US	Wood Pellets	We have access to species that make a better pellet than what is being exported to Europe.
GB	Wood Pellets	Standards are critical for the product toi work properly
US	Wood Pellets	To my knowledge we have the best residential pellet made worldwide.
US	Wood Pellets	There must be a technical standard so that users of a commodity can place the correct value on the product bases on how much energy will be produced by each quality grade of product.
US	Wood Pellets	The exported pellets are being burned in 'boilers' that are made to burn even the lowest standard of pellets.
SE	General expertise	Standards have the possibility to facilitate the trade since the buyers can specify what they want and the sellers specify what they have. My opinion is that this should stimulate trade. Especially if technical standars also include sustainability aspects they might be important for the future bioenergy trade.
AR	General expertise	Clear and standardized standards can only help improve trade in the long run.
EU	General expertise	I have been involved in international trade of pellets in my earlier jobs. The international standards are very important for international trade of agreed quality
GB	General expertise	an alround standard which is realistically achievable is great if there is a level playing field. Thoughts for other simular greener products should be taken into account and there charatoristic differences should not be ruled out if they have a greener potential.
NL	General expertise	Existing (different) standards for EtOH between e.g. US, EU and Brazil seem to be only a minor barrier, as water content is the critical one and hydrous ethanol can be easily dried. For biodiesel standards partly refer to the fatty acid composition, which is hardly changeable. For wood pellets the development of a (uniform) set of technical standards can greatly facilitate trade.
US	General expertise	Depends on importing nations standards
US	General expertise	Imposing standards is designed to impose barriers on materials which do not meet those standards. At the same time, it gives a huge opportunity to those who find ways to effectively meet the standards. Unfortunately, as far as trade goes, it may mean that inferior product remains in the area of development while the superior product is traded internationally.

Appendix 4 Answers by respondents on sustainability criteria

Country Code	Expertise	
GB	Ethanol	Sustainability criteria COULD be used as a non-trade barrier if regulated in that direction. If fairly applied across the board they will level up the playing field and create major opportunities.
BR	Ethanol	As long as there is no uniform, global standard for sustainability, any act to enforce these standards, are per se a trade barrier and contribute to protectionism
GB	Ethanol	It depends. Sustainability criteria are meant to protect from misuse and abuse. At the same time, it can be used as a weapon for marginalization.
ZA	Ethanol	In developed countries, sustainability criteria are going to increase in importance whether the biofuel is locally produced or imported (supply chain). This will be a minor barrier to trade. What is more significant is the future insistence by the consumer on sustainability criteria (in particular, climate change & GHG emissions), which will be a major influence on trade as a barrier. Consumers and particularly the youth will drive the sustainability & climate change agenda in coming years.
BR	Ethanol	The sustainability criteria is not working yet as a major trade barrier, since the criteria is not yet clear to most brazilian producers and EU is still buying on loose 'sustainable' principles. But as soon as the Energy directive comes in line, we might have a major trade barrier but, at the same time, helping the producers to have a cleaner production line. This might be a necessary evil.
ZA	Ethanol	In order to trade the production of biofuels should be sustainable in the domestic country - if not trade is also not viable.
MY	Biodiesel	Complexity. Sustainabilit Standards required of Biofuels not required of other trade commodities with environmental, social and GHG impacts. Continuing future uncertainty due to ongoing review provisions of EU Renewable Energy Directive. Unclear which Standards, Cetification and Chain of Custody proceedures will be applied. Will be used as non-tariff barriers.
DE	Biodiesel	Answer depends on short term or medium term influence and also extent and implementation of sustainability criteria. In all cases sust. criteria may change trade flows and provide opportunities for producers which can provide evidence of sustainable biomass production.
ID	Biodiesel	We are facing a major global warming problem and we have to put extra effort to make sure each drop of bioethanol or biodiesel must be from a sustainable business activity. Meaning not cutting forest, not using chemical fertilizers, treat all processes/plant waste properly will help us reducing the emission globally. Also by managing this industry to be environmentally friendly we will have opportunity from carbon credit (CDM) as another potential source of revenue
AT	Biodiesel	With sustainability criteria a lot of 'bad behavior' in the industry can be reduced and we will arrive at a biodiesel production that makes sense ecological and economical
AT	Biodiesel	it´s a good arument for the sales
NL	Biodiesel	Our plantation is setup with the Dutch Cramer criteria in mind. So the Dutch sustainability rules are applicable to our products.
GB	Biodiesel	Will be settled by European regulations; will then not be an issue.
AR	Biodiesel	Specially LUC and iLUC can be critical in the future

ZA	Biodiesel	Sustainability enables both supply and quality. The absence of sustainability poses a threat to continuity of supply and standards. My choice of 'minor barrier' was a difficult one, sice it really borders upon 'major barrier'.
MY	Biodiesel	Biodiesel from Tropical Oils should not be discriminiated on the assumption that it is not environment friendly. The rigour of sustainability standards should be the same for Biodiesel from all sources.
ZM	Biodiesel	its to early to say whether it would a barrier or not though it has been said by the majority that it negative effect especially for companies from third world countries.
BE	Biodiesel	While ensuring the sustainability of bioenergy and biomass production is a legitimate concern, the way in which sustainability requirements are implemented at international level can represent a significant barrier to fair international trade. This is why we assess the impact of sustainability criteria as ranging from “neutral” to “major barrier”. In the view of EBB, the bottom line is that sustainability criteria should be implemented in a transparent, horizontal, cost-effective and WTO-compatible way. More specifically, the following adverse impacts of sustainability criteria should be avoided: - Creating unjustified burdens for individual operators: sustainability criteria should be designed in a way that is workable for operators, especially considering that biofuels are commodities traded on a world-wide basis. Here, the efforts should be focused on drawing clear rules for the chain of custody and balances reporting requirements for individual operators (producers, traders, end-users…) *Due to a technical problem, the remainder of the EEB response was lost.*
NO	Wood Pellets	Sustainability issues/uncertainties affects demand.
SE	Wood Pellets	It is absolutely necessary to have these criteria for the bioenergy trade, that is the basis for bioenergy. However, if it is a barrier or opportrunity is probably different from country to country and for different producers.
SE	Wood Pellets	Wood pellets is mainly produced of waste from sawmills or other industry
NL	Wood Pellets	Sustainability will be a major condition to market and sell biofuels. Traders will need standardization, for instance transparent certification schemes.
NL	Wood Pellets	Good criteria will increase acceptance of biomass as a sustainable energy source plus it will stimulate professional production (small one-day-flies will be eliminated from the market)
GB	Wood Pellets	There needs to be a common consensus on exactly what 'sustainability' means. Before going to full sustainability criteria I would recommend a form of carbon accounting certificates be developed.
BE	Wood Pellets	It is getting increasingly difficult to conform to or 'slalom through' the ever expanding patchwork of 'sustainability concepts'. It is insufficiently realised and accepted that every activity of man on a meaningful scale has downsides next to the intended upsides. Contributing an out of proportion weigtht to the downsides, will eventually make it impossible to do anything 'right' or 'sustainable'.

SE	Wood Pellets	Like standardization, the less unified the sustainability criteria between certifying bodies - be it industrial or governmental or even across regions - the stronger the barrier to trade. The lack of transparency will force producers to produce to the most stringent level of criteria if it wants to have the widest market possible. Otherwise, they'll be beholden to the pockets of markets where their production meet those markets' criteria, and not others. However, it's clear that sustainability criteria need to exist, as long as there is consistency between competing criteria.
JP	Wood Pellets	Wood pellets always compete with wood chips, so it have to be cheap. When we think about cost of pellets, raw material is important. That's why many of raw materials from saw mills. It means by-products. I think it is very difficult and it cost too much to prove sustainability.
DE	Wood Pellets	Governments are reluctant at this time to subsidize the use of woodpellets because of sustainability issues. A standard or certification might help in this case. Major users for sure will only use pellets that are (internationally) certified, for both trading reasons and for corporate social responsibility reasons, and for getting subsidies.
DE	Wood Pellets	Perhaps a bit more clarity on sustainability would actually boost biofuels trade; at the moment, the lack of an agreement on what's sustainable and what's not is hampering the development and use of new products.
SE	Wood Pellets	Bioenergy and sustainabilty belongs to each other - how on earth can we be trustworthy without sustainaqbility criteria?
CA	Wood Pellets	industry would be more certain of what they are buying.
CA	Wood Pellets	Sustainability criteria could make it very difficult for the producers of pellets to comply with at the short run. It's another regulation where they have to worry about and this is very time consuming to sort out. This hinders the continuousity of trade.
GB	Wood Pellets	Sustainability criteria will be a major opportunity to increase the use of pellets in domestic and public sectors. They may put off industrial users if they have an affect on price.
GB	Wood Pellets	Under new European rules the UK has to report on sustainbility of imported and UK produced biomass
NL	Wood Pellets	it could work-out two ways, bad or good
NL	Wood Pellets	Certifying and monitoring sustainability criteria costs money per ton woodpellets traded. Unless linked to subsidies, this will result in less buying power from EU.
NL	Wood Pellets	political choice
NL	Wood Pellets	The sustainability of bioethanol and biodiesel prohibit certain 'unsustainable' sources which can play a role in performance of biodiesel and the price of the source of bioethanol
NL	Wood Pellets	Sustainability criteria might limit the potential of bioenergy, thus a minor barrier. Otherwise, sustainability criteria only raises the costs of bioenergy, which might reduce trade also in a minor way.
DE	Wood Pellets	Effect is highly depending on sustainability criteria applied / utilized and practicability and harmonization

NO	Wood Pellets	To much focus on sustainability criteria for bioenergy might give an unbalanced view of the overall sustainability of bioenergy compared to other agricultural and forestry production. It might hamper the development of bioenergy as a conventional commodity.
NO	Wood Pellets	There has been controversies over the 'sustainability' of biofuels. This is certainly linked to information and sustainability criteria may be a major opportunity (as long as the different bioenergy commodities turn out to meet the sustainability criteria).
CA	Wood Pellets	Although we regard our wood and grain practices to be sustainable, there are still major questions about what sustainability actually is. Mistakes have been made and may again. As an example, to make things simple the Dutch government included sustainable pyrolysis oil in with unsustainable palm oil in their legislation for feed-in-tariffs, providing a clear advantage to pellets, which is half as energy dense as pyrolysis oil.
AT	Wood Pellets	Proof of sustainability of the chain will help wood pellets to be distinguished from other biofuels which have in the past led to major concerns of the sustainability of biomass in general
RU	Wood Pellets	it is hard to produce pellets out of certified forests.
US	Wood Pellets	As stated before, sustainability criteria should be mandatory for all bio energy production systems. Trade is impacted positively because customers want to know they are doing the right thing. minimum sustainability criteria provide an objective framework for assessing whether the production of a bioenergy feedstock is done in a responsible way.
GB	Wood Pellets	CSR, the triple bottom line, and sustainability definitions that incorporate social and human-rights aspects for which there is no satisfactory standard or metric are philosophically and practically misguided. We should internalize environmental externalities through a rational carbon price (which means tax, not cap-and-trade), and leave social and human-rights issues to NGOs to expose and consumers to judge. The large energy consumers are more worried about contaminating their brand than they are about bureaucratic exercises - they rather like the latter because it provides a barrier to entry for smaller businesses who cannot carry the overheads so easily, and thereby protects their margins.
US	Wood Pellets	In our area there have been many sawmills permanently shut down. I do not think there will be a problem with sustainability in this area for some time.
GB	Wood Pellets	If the overall sustainability of a particular energy choice is made clear including transport miles then the end user is able to make an informed choice, which should favour local production, not importing.
US	Wood Pellets	The cost of oil will need to increase dramatically for bioethanol and biodiesel to be a viable source of energy. How many crops can we dedicate to fuel and can they figure out how to economically use wood fiber. In the short term there will continue to be more interest in pellets. After oil increases, our market is driven by the cost of natural gas, which typically follows oil.
US	Wood Pellets	Sustainability is hard to quantify...what is sustainable is one country may not be in another country. Depending on what stage of development the country is in with regards to their own conservation, fertility, and agrinomic practices, determines what is sustainable there.
	Wood Pellets	There is a world wide shortage each heating season for wood pellets.
GB	Wood Pellets	In Scotland many local authorities are choosing not to consider wood pellet fuel because of a concern that they are not sustainable and a desire to make use of local wood supplies in the form of wood chip.

SE	General expertise	I think this question depends on the time perspective, so I chose I don´t know. In the short term I think sustainability criteria might act as a barrier since very few bioenergy products will fulfill the critera. However in the more long run I think it will increase the bioenergy trade and then represent an opportunity.
AR	General expertise	An important consideration; however, must be established by working jointly with the Emerging Market countries. Until now, most of it is being imposed on them.
EU	General expertise	Depending on how the criteria is constructed there is a risk that the criteria is used to protect domestic markets. We prefer definition of non go areas and the same rules both for food and bioenergy production
GB	General expertise	If these products are not green and sustainable there is no point them being on the market
NL	General expertise	Everything here depends on the complexity of the sustainability criteria and how difficult it will be to meet the standards. Additionally, the accounting method will affect the amount of administrative costs related to prove compliance.
NO	General expertise	There is some uncertainty about sustainability for liquid biofuels. Wood pellets is not questioned.
US	General expertise	Again, this has to do with values. Some will experience barriers; others major opportunities. And it depends on the credibility of the sustainability criteria. Certainly, reasonable sustainability criteria will benefit our overall long term viability; although in the short term it may cause disruption. The key is to base the criteria on credible, measureable, scientifically authenticated and peer-reviewed systems, information and data.

Appendix 5 Answers by respondents on logistical barriers

Country	Expertise	
GB	Ethanol	Creation and operation of infrastructure will be a commercial opportunity
BR	Ethanol	logistical costs are a relative smaller part of the total cost structure; however differences in logistic costs between exporting countries may have a negative impact on building a global biofuel/pellet market;
GB	Ethanol	This should be an opportunity for other sectors like shipping, logistics company.
ZA	Ethanol	In South Africa the deterioration of our infrastructure is a major threat to maize exports - should be the same for any commodity.
ZA	Biodiesel	Poor logistical networks within Southern Africa allow for more varied fuel pricing and higher prices in more inaccessable areas. This lends support to the concept of growing and using a biofuel in an immediate radius area rather than growing it in one area and then transporting it for use in another
ID	Biodiesel	Logistic are very important role to this business chain of bioethanol and biodisel. Quality, volume and time delivery can be damage easily if the logistic and infrastructure are not manage properly. For example in Indonesia many businesses are prefer to deal international trade base on FOB basis, because the lack of infrastructure from road, trucks, ports, storaging & vessels. In other hand many buyers overseas are required CNF basis of commodity they are trade, and because of this many business deals can not be finalize.
AT	Biodiesel	its just a challenge
NL	Biodiesel	As these products are new, the infrastructure is at many place in a poor state.
ZA	Biodiesel	Zambia's road and rail infrastructure is up to standard for bulk carriers and rail shipments to nearest harbor
AR	Biodiesel	Depends from the distance of production areas to the ports
FI	Biodiesel	Logistics chains must be transparent. Consumers must know in details the whole production chain like in food production
ZA	Biodiesel	The issues surrounding transport of biomass (raw materials) is a far broader one, not restricted to fuel. It should always be more viable to process art source, at least to some extent. The movement of high mass, low value product poses major economic barriers.
MY	Biodiesel	In the major producing countries it is not considered a major barrier
ZM	Biodiesel	infrastructure is critical when it comes to trade. whether international or local. surly developing countries will face major challenges in trading internationally in biodiesel as their logistics bottlenecks are so high. all these would result in the fuels from developing countries so expensive and un competitive.
NO	Wood Pellets	Harbor facilities and storage facilities affects size of ships and hences costs.
SE	Wood Pellets	efficient logistics are of crucial importance
SE	Wood Pellets	Wood pellets is mostly easy to transport but there could be some problems with storing and reload ex. from boat to truck etc. how maybe could effect the quality
NO	Wood Pellets	imo are a problem
AT	Wood Pellets	Train transportation is still to unattractive for wood pellets and not used. There are not enough storage capacities for Wood Pellets and still there is a lack of know how in transport and storage.

NL	Wood Pellets	Port transshipment capacity of wood pellets will not really be an issue, as all existing dry bulk transshipment terminals will be able to do this. (The lack of) storage capacity on the other hand can be an issue to support further growth in wood pellets use. Also transport capacity to ports or to the hinterland can be a limiting factor, as expansion of this capacity can cost a lot of money.
GB	Wood Pellets	Generally if the price is right logistical problems can be easily overcome. It is important for suppliers to recognize this when they offer wood pellets and other biomass.
DE	Wood Pellets	Permits for storage of wood pellets are for instance in the Rotterdam area very difficult to obtain. This seriously limits the large scale usage of wood pellets.
CA	Wood Pellets	Without an efficient and sufficient logistical network a growth in biomass trade is not possible.
GB	Wood Pellets	This is not perceived to be the main barrier in the UK at the present time - market forces would have to increase the demand for pellets before this was seen as an issue.
GB	Wood Pellets	without good logistics the movement of pellets would fail and the trade would be restricted to own country.
GB	Wood Pellets	Port facilties are designed of the import of high value goods and bulk commodities such as coal. sensitive material such as wood pellets are difficult to handle and manage without proper infrastructure.
NL	Wood Pellets	WP is a low value commodity, every handling or km transport decreases the value even more
NL	Wood Pellets	Logistics are a cost factor and therewith reduce the competitiveness of producers that are located in areas not close to export ports. Export becomes only interesting for these producers, if wood pellet prices are high enough to pay back the logistics. For us as a logistics-and trading company this is an opportunity: we believe market will be short, therefore prices go up, and since we are good at logistics, it is an opportunity for us to buy from producers that are not easy to reach.
NL	Wood Pellets	logistics are the main factor in some cases the transport is more than the value of pellets.
NL	Wood Pellets	Depending on the certification system which will be chosen mass balance is of benefit for diesel and petrol
NL	Wood Pellets	It depends on the location. For the Netherlands, the logistical issues are a major opportunity. For other countries, it is a major barrier. The wish of large power plants to be located near the coast (mostly due to cooling water issues), nicely coincides with the logistical requirements for imported wood pellets.
NO	Wood Pellets	Bioenergy goods have much the same physical conditions as other agricultural and forestry products which are traded and handled widely. However since bioenergy in many ways are marginal products with a marginal price potential compared to conventional energy commodities it is important to make all links in the value chain as efficient as possible.
CA	Wood Pellets	The massive increase in pellet production in BC has exposed several logistical bottlenecks in the supply chain, that will only get worse unless addressed.
AT	Wood Pellets	If only costs of transport would remain constant. Hence my answer is describing todays situation but would have been very different a year ago
US	Wood Pellets	Given the large start up costs with new infrastructure it would be important t get these things right the first time. I would also add poor site selection for facilities to the list.

GB	Wood Pellets	UK biomass is dependant on logistics, because of its paucity of native biomass resource. The UK's infrastructure (ports, motorways, etc) is adequate, although investment is required in storage, depots and specialist haulage vehicles for wood pellets. However, the relative costs of transport (very high) and energy (very low) in the UK means that logistics provide the most significant, unintentional, economic barrier to wider deployment of wood-pellet boilers.
BE	Wood Pellets	The choice of a production site is the most crucial part to avoid major barriers for logistics. On the other side it is still very difficult to find for example train connections between different countries for the transport of commodities like wood.
	Wood Pellets	Major port export problems along the great lakes interior of the US
SE	General expertise	Logistical problems should be less of a barrier for liquid fuels than solid ones since we are used to trade in liquid fuels like oil/petrol.
GB	General expertise	best to use local and not rely on imports
NL	General expertise	Logistical issues can always be solved, see al other bulk commodities that are currently traded. This is a very conventional challenge, so to say.
NO	General expertise	Liquids are commonly traded, wood pellets is coming, but costs is to some extent a barrier.
US	General expertise	Larger economies of scale
US	General expertise	The mass of biomass is definitely a problem. A 'follow the crop' system as described by Atlantic Biomass Conversions, Inc., in an application for US ARPA-E funding will address may of these problems. Currently, however, logistics are a major barrier. Even with the 'Follow-the-Crop' system, other logistical barriers will require equally transformative solutions.

Appendix 5 Answers by respondents on Phytosanitary measures

Country	Expertise	
GB	Ethanol	Minor opportunity for feedstocks that are unsuitable for the food chain to be converted into biofuel
BR	Ethanol	it depends on the perspective; SPS measures may inhibit some producers to export their biomass/feedstock; however this may create an opportunity for others; this is how markets work
ZA	Ethanol	We can expect that biofuel-products will have particular certification standards but this is normal market expectation and so I do not forsee this being influential on trade.
ZA	Ethanol	Should have no effect - raw material is processed into a non-viable commodity.
ID	Biodiesel	We never facing any problems on the SPS, only when exporting or importing raw material (e.q. jatropha seeds), then SPS need to be in place to protect the destination country from potential harm.
ZA	Biodiesel	Currently we do not use any pestcides to grow our trees. We don't have any problems with bugs or insects that needs to be sprayed with any pesticides.
FI	Biodiesel	In many countries like in Germany energy utilities are cheating authorities and burning other kind of biomass than agreed to optimize incomes /tariff fees. Without gapless control of biomaterial flows many kinds of illegal phenomenon will arise. That´s why origin tracing is crucial for development of whole above mentioned industries.
ZA	Biodiesel	In Africa this is irrelevant internally. However, the export of feedstocks to the developed world will require standards of pest or pathogen control which may be impossible of compliance, or at least very difficult in the third world environment.
AT	Wood Pellets	I do not know about PS measures for pellets, but there are some for wood PALLETS, they may also become important for overseas trade of Pellets.
NL	Wood Pellets	Aspect that can be of importance is the possible existence of pests in woody materials. Don't know if pests are effectively removed in the production proces of wood pellets.
GB	Wood Pellets	I am not aware of any SPS measures that have to be taken for wood pellets however wood chips have to be fumigated.
JP	Wood Pellets	In Japan, we have phytosanitary measures for wood chips (for pulp), but not for wood pellets. Because pellets are compressed with high pressure and heat.
GB	Wood Pellets	Never heard of this being an issue for wood pellets
GB	Wood Pellets	None as they are heat treated in process
DE	Wood Pellets	Currently there are no public/governmental regulations for imports to use pesticide/fungicide residues for wood pellets.
US	Wood Pellets	With the projections of the EU needs for pellets there might be opportunities for export.
GB	General expertise	treating fuel to simular standards as food is only a good thing. It does not seem right plastering green fuels with chemicals. Storing and transporting them them should adopt stringent tracebilty controls to avoid contamination.
NL	General expertise	I'm sorry, I have no expertise in this issue.
US	General expertise	Although there are no SPS measures for wood pellets, I can more readily imagine pesticide residues remaining with them than with bioethanol or biodiesel. These are fuels for goodness sake. They are by nature poisonous. I think the problem of residues is more likely to arise with animal feed co-products that have chemical residues from the fuel production process.

Appendix 6 Answers by respondents on lack of global classification and clear bioenergy trade statistics

Country	Expertise	Please explain your choice.
GB	Ethanol	This sort of issues will be dealt in the short term by regulators
BR	Ethanol	These problems inhibit the building up of a global market, but are of minor importance relative to the others altready mentioned
GB	Ethanol	A clarification of trade statistics is needed to guide an unbiased international trade rules. It is a minor barrier and can be worked on.
ZA	Ethanol	In an immature market many unforseen implications haven't been addressed yet and so there may be minor opportunities to take advantage of these naiveities until issues arise and are solved.
ZA	Ethanol	In a free market, raw material (feedstock) for bio-ethanol and biodiesel compete with prices in the food market and is not comparable. The better quality commodity flows to the higher prices in the food market and the lessor quality should go to the biofuels market. In the case of commodities such as maize (corn) prices lower because of the abundance of feedstock available. But prices of food should always trade higher than the price of feedstock for the biofuels industry. The increase of raw material production for biofuel purposes could only favour lower food prices. We saw a structural changes in agricultural prices globally and in general because they were too low for a long time.
DE	Biodiesel	Better classification and statistics is certainly desirable, however the impact on real trade may be limited and can be positive and negative, depending on commodity and country.
ID	Biodiesel	We need to have an update for classification to make the export import activities and tariff setting are clear to all parties.
ZA	Biodiesel	Because we use the out grower scheme, goverment have approved incentives to all participating farmers. Currently we have 23 650 contracted farmers planting Jatropha trees. See www.menergycorp.com for further details
ZA	Biodiesel	The main issue is one of maintaining the 'status quo'. There is no consistency of approach at present at an international level, nor are there guarantees of any consistency in future. This has a negative impact on confidence and investment.
BE	Biodiesel	Until 2008, there was no specific CN code at EU level for biodiesel imports. This made the tracking of biodiesel imports before 2007 rather difficult. Now that a specific CN code 3824 90 91 has been provided to cover imports of biodiesel (FAME), there is still a concern that some traders may still be using the residual code 3824 90 97 when entering biodiesel in the EC, notably to circumvent the EU duties on US biodiesel. More generally, it should be noted that the customs definition/classification of biodiesel, be it at EU or World Customs Organization level, covers only currently traded biodiesel (“fatty acid methyl ester”). Therefore, next generation biodiesel technologies (BtL, hydrodiesel…) remain classified in chapter 27 of the harmonized nomenclature. It seems particularly important that future negotiations on biodiesel customs classification takes into account the latest technological developments (also for instance algae biodiesel) and promotes a classification/definition that takes full account of *Due to a technical problem, the remainder of the EEB response was lost.*
NL	Wood Pellets	When trade statistics are lacking, it's difficult to interest potential investors to pay attention to the wood pellets trade market.
GB	Wood Pellets	There are a few tax issues associated with classification of some forms of biomass but I am not aware of any issues of this type that relate to wood pellets.

SE	Wood Pellets	Clearly the lack of statistics will be a barrier because without fundamental market information, market activity will continue to be an intransparent game and decision-making will be riskier. Capital flows into the sector will be hampered if market information is limited, because investors are less willing to base their decisions on hearsay.
JP	Wood Pellets	When we create biomass market in order to prevent global warming, international classification and statistics is very very important. It is also important for global business.
CA	Wood Pellets	Through misunderstanding or unclear description of fuel it is sometimes difficult to predict whether changes in composition are allowed, for instance creating a torrefied wood pellet.
GB	Wood Pellets	It is incredibly difficult for prospective traders and manufacturers to get statistics on the use or demand of pellets - which makes it very difficult to make a commercially sound decision whether to get into this market (and raise finance).
GB	Wood Pellets	Not important at the moment
GB	Wood Pellets	international homogenous classification would improve (scientific) research on development
NL	Wood Pellets	Level playing field for ethanol not achieved (USA support)
NL	Wood Pellets	This question has some relation with a previous question, regarding the quality of biomass.
DE	Wood Pellets	It might be an important topic especially if wood plantations will become a major pellet fuel source.
NO	Wood Pellets	Both to show the potential and in order to develop necessary measures statistics are crucial. Without any prove in numbers and reliable data it will become difficult to continue to develop policies for increased production and use of bioenergy in competition with other renewable energy sources.
NO	Wood Pellets	In the long run, increasing energy demand will be more important then classification. In the short run it may be an opportunity if bioenergy is classified as ag. product and there is an import tariff in place.
US	Wood Pellets	Different organizations may have different ideological reasons for why or why not they would like some feedstocks labeled in certain ways. While an internationally accepted definition would help, I am not sure this is a possibilty.
GB	Wood Pellets	Better classification might help find suppliers and customers on database (e.g. OJEU and equivalent). But not a major obstacle to date.
US	Wood Pellets	With statistics out there where everyone can see how the EU uses pellets, it would stimulate the use of pellets domestically
US	Wood Pellets	No one can afford import or export problems with a shipment of bio energy products. Financial companies will not participate such transactions that have risk of dispute.
	Wood Pellets	Need a world wide classification on wood pellets as an agricultural product as soon tree farms will be popping up and of course this would be considered an agricultural crop.
SE	General expertise	For the trade as such I do not consider the lack of data being a barrier. However to keep track of the trade it is frustrating.
GB	General expertise	non clarification can lead to spend in one direction and then the tables turning. Although there may be some very good short term gains whilst in the mist it is very risky when the fog clears.
NL	General expertise	As a researcher, I'm frequently frustrated by the absence of clear classifications and statistics. However, for trade itself, lack of statistics may not be an essential barrier (classification might be).

Appendix 7 Answers by respondents on other barriers for bioenergy trade

Country	Expertise	
GB	Ethanol	More involvement of the oil industry; the cost of externalities (for fossil fuels it is often ignored)high cost of the feedstock
GB	Ethanol	Global methodologies for a practical application of a chain of custody verification. Lack of a globally accepted Green House Gas (GHG) methodology. Multiplicity of sustainability standards could end up being an effective barrier for economic operators to move product between geographies.
BR	Ethanol	Bioenergy trade faces geopolitical barriers due to the role of some countries that are distorting markets by perverse subsidies. The US is the example at this moment. There is no justification for another subsidy scheme next to all these schemes that agricultural is already facing globally.
AT	Ethanol	missing blends with a higher admixture of bioethanol
GB	Ethanol	Institutional barriers.
US	Ethanol	The classification of carbon dioxide as a pollutant will place limitations on the use of any carbon-based energy source.
ZA	Ethanol	Border carbon adjustments (BCAs) have been proposed both by Bills in the US Senate and the EU to level the international trading field between developed countries (who have mandatory GHG emission reduction targets and therefore higher production costs) and developing countries (that do not have mandatory carbon emission caps and therefore lower production costs). These BCAs will have an effect on trade between North & South.
CA	Ethanol	biomass logistics
ZA	Ethanol	It is not specifically a barrier to trade but the lack of a sensible national biofuels industrial strategy to get the biofuels industry in South Africa going in terms of government support e.g. compulsory blending is a barrier to domestic development. Without the latter, barriers for bio-energy trade is actually an irrelevant debate for South Africa - in terms of our policies we are not there yet!
ZA	Biodiesel	In theory, the maximum benefit of biofuels comes to the fore when they are produced and consumed within the immediate area. The concept of producing biofuels in one part of the world and then consuming huge amounts of energy by transporting them to the other side of the world for use negates much of the benefit derived from biofuels
MY	Biodiesel	There is another major barrier. Some countries restrict to use some kind of feedstock. Even the products are compliance but feedstock are not then it creates another barrier.
MY	Biodiesel	Sustainability objectives include use of marginal lands and income generation opportunities for impoverished farmers, however, sustainability standards, certification and chain of custody requirements are substantial cost and administrative barriers to smallholder production of biofuel feedstocks in the marginal lands in developing countries.
DE	Biodiesel	Protective attitude of countries, especially in highly subsidised markets. Sometimes justified with security of supply arguments
GB	Biodiesel	A lack of universal certification scheme would be one of the reasons why biofuels development has been hindered recently, even though we care observing strong supports from some parts of the words. That certification scheme should be able to guarantee sustainable production of biofuels as well as all the benefits of biofuels supply and even distribution.

ID	Biodiesel	We are all understand that fossil fuel reserve are decline and consumption are increased from time to time. Adding to the fuel crisis, we have major issues of global warming & environmental destruction (deforestation, non-recycle materials, chemical products, etc) and we need a global effort to fight the above by promoting more production and application of bioenergy in the future. I think we all need to be in one perception and same pace for the standard, regulations and tariffs. More incentives from government bodies and or NGO's will help to increase activities on this field.
AT	Biodiesel	more and more redtapism
NL	Biodiesel	Uncertain government rules, criteria. In order to produce sustainable biomass, there is a need for a stable market to develop this branch.
ML	Biodiesel	country legislation on biofuel production
ZA	Biodiesel	The main barrier that we have experienced is finding the correct business partner/investor or technology partner/investor to start one of the biggest bio fuel projects in Africa
AR	Biodiesel	There is a need to clearly separate energy crops from the use of byproducts of food crops. This is the case of soybean oil in Argentina the main export biofuel of the country.
US	Biodiesel	Local control of export transactions by multinational entities such as Cargil, Monsanto, Bunge, etc especially in Buenos Aires ports. Small scale producers see themselves forced to sell their product to major biofuels producers because they cannot find a way out of the port to sell their product without abiding to multinationals' export regulations and restrictions.
DE	Biodiesel	Informations must be supported by the government.
FI	Biodiesel	Infrastructure like shape of roads is a major barrier. In some countries 60 tons weight limit is allowed but in most European countries only 40 tons. Transportation costs may cause differences between countries.
ZA	Biodiesel	The obvious barrier to biofuel trade in the volatile price of crude oil which often makes biofuel production uneconomical, and creates great investment risk. The lack of government interest in providing meaningful investment and tax incentives is another major barrier in most African countries.
US	Biodiesel	Ability to locate buyers of biodiesel or wood pellets in various regions of the world: it is difficult to find potential buyers.
SE	Wood Pellets	misunderstanding of what bioenergy/biofuels are I.e. here in this study other solid biofuels like wood products apart from wood chips are lacking!!
SE	Wood Pellets	Transportation costs in general for wood-pellets
SE	Wood Pellets	National regulations are in some cases changed too often and are in some cases also quite difficult to interpret.
NO	Wood Pellets	biomass should be standarized internationally
AT	Wood Pellets	Wood Pellets are vulnerable to water, therefore they need to be handled with much care. Torrification can be a solution. Another solution could be impregnation with palm oil, this increases energy density and makes pellets water resistant. The process is simple. The problem is standardisation. This solutions create new fuels which need specific standards and markets. Certification: Certificates for wood pellets are national (DINplus). Therefore they depend on national profit oriented organisations. This can hamper international trade, because the availability of certificates is limited in some countries. for example the barrier to get a dinplus certificate is much higher in Canada or Russia then in Germany or Austria. But the certificate is very often needed to enter the market. The solution would be international certification systems.
NL	Wood Pellets	Uncertainty regarding political developments (subsidies, environmental, sustainability) and uncertainty regarding (the advance of) technological developments can be a barrier regarding investments.

SE	Wood Pellets	For wood pellets, the lack of price transparency must be emphasized.
LV	Wood Pellets	Lack of overall information about sellers and buyers of pellets is a barrier
SE	Wood Pellets	laws and regulations in different countries, support schemes
SE	Wood Pellets	Different support schemes in different parts of the world.
GB	Wood Pellets	Different port charge structures and levels for different ports in different countries.
SE	Wood Pellets	When it comes to the pellets industry, limited capital inflows from the private sector will forever be a barrier to trade unless the industry does a good job of marketing to the investment community. I'm constantly amazed at how much mind space is taken up by other forms of renewable energy instead of pellets or other solid biomass trade - which I consider to be a lower-hanging fruit when it comes to meeting climate change goals.
JP	Wood Pellets	Sometimes, movement for 'local production for local consumption' is a barrier, when we introduce foreign pellets for local market.
DE	Wood Pellets	- lack of level playing field in different countries, because of different incentive scheme's. Price is set by the country with the highest subsidy/penalty.
DE	Wood Pellets	The main barrier to the development of an international bioenergy trade is a psychological one; all actors involved -corporate and governmental- should be less political and more business oriented. Ultimately that is the only way a self sustainable biofuels market will develop, without the need for subsidies.
CA	Wood Pellets	Instability in Energy Policy. For instance, most Canadian suppliers are dependent on European Policy and related subsidies. That makes future very unpredictable and impedes further expansion.
FI	Wood Pellets	The daily rated eur price per ton, per quality class is not provided in any public market places.
GB	Wood Pellets	There is a lack of openness about world pellet prices, although data for Europe is currently being collect through the Pellets@las project - www.pelletcentre.info
GB	Wood Pellets	There is an overall general lack of understanding of biomass and in particular the sustainability issues that surround biomass production. There is a general perception that biomass is freely available world wide without due consideration for indigenous use or the effect on the environment. This is generally the case with biomass traders and end users looking for biomass.
NL	Wood Pellets	uniform international support schemes will lead to more and uniform trade
NL	Wood Pellets	A barrier is the unclear position of governments on providing subsidy for biomass as a fuel for electricity production. This creates uncertainty for investments in biomass-to-power plants as well as wood pellet production plants.
NL	Wood Pellets	All depends on the stability of politics rules and the structural buying and stability price range for the Power plants
NL	Wood Pellets	Financial incentives are present in different parts of the bioenergy value chain. Subsidizing schemes for bioenergy crops can be followed by for example subsidizing the biofuel production. Country by country differences influence the end price and the flow of fuel to the highest bidder. Some countries even keep their borders closed for competitors (Belgium)
DE	Wood Pellets	liquidity of the market (major barrier, no liquidity nowadays, small market --> no functioning price index due to small market volume)
BE	Wood Pellets	- The raw material availability

NO	Wood Pellets	National policies and national targets linked to other challenges in society than energy issues will hamper the development of bioenergy. Competition from developed industries will also become a larger barrier as bioenergy develops as a true competitor.
AT	Wood Pellets	a)insufficient transparency and missing of INEICES or other means to form basis for risk hedging tools b) reluctancy of financiers to provide investment and trade finance c) disquilibrium between number of producers and number of non private consumers
RU	Wood Pellets	price secret which a lot of companies don't tell the exact price which is important for Russia, small amounts of produces biofuel by each plant and some other
GB	Wood Pellets	PRICE!!!!! INCENTIVES. TAX POLICIES. Why do all bureaucrats and academics think that price is somehow irrelevant? It is everything. Energy prices in the UK are too low, and support for green heat too non-existent, for wood pellets to be viable in most instances at the moment. If one compares the EU-15 countries, there is a strong correlation between the differential between the price of wood pellets and the price of the dominant fossil heating-fuel, and the extent to which biomass heating has been developed. A difference of 20 EUR/MWh is the minimum needed to see much meaningful development. A difference of 30 EUR/MWh will see a massive expansion of installed capacity.
KE	Wood Pellets	Financial constraints, lack of community engagement at all levels, political influence, social -cultural influence
GB	Wood Pellets	The major barrier to the international bioenergy trade is that it is inherently unsustainable if the biofuel can be supplied from within a country. If it can't then many other questions about the alternatives need to be addressed before importing biofuels can be justified. There may be circumstances where it can - in stimulating market growth for instance, as is happening in the wood pellet market in the UK; but ultimately pellets should be made and supplied from within the same area as the end user to fully benefit from the sustainability credentials of pellets.
US	Wood Pellets	Costs: With all of the mill closures our raw material costs have doubled in the last two years. Freight to the port, port fee and shipping
US	Wood Pellets	In the USA, the current discussion of Indirect Land Use relating to the production of feedstocks is a major issue. First how can one determine, in advance, what someone will do with their land resources a half world away or in another hemi-sphere. Sustainable land use is not determined by what can I sell, but by locally is the purchase of this land a good value. Now that I own the land what is it best use for profit and sustainability.
	Wood Pellets	Very high cost of transportation to Europe, need subsidies to get wood pellet fuel to Europe successfully. Low price paid in Europe for high price shipping is nuts!
SE	General expertise	Other national policies focusing on national use of domestic biomass which influences the interest in international bioenergy trade but which might increase the local/regional trade Less ambitious CO2 policies or biofuel polices, decreasing the demand for bioenergy
GB	General expertise	Barriers to PPO (pure plant oil) due to taxation Lack of ready infrastructure to adopt rape meal pellets as a high energy green fuel as manufacturers of boilers only use the spec of low energy wood pellets.
BE	General expertise	legislation and subsidies
NL	General expertise	Security of demand, i.e. demand fluctuations also induced by changing policies, can also be a trade barrier.
NO	General expertise	Lack of information, traditionally local markets, too low volumes to make efficient logistics including marketing and distribution.
US	General expertise	Financial Barriers, seeking the proper guarantees that the goods will be paid for.

Appendix 8 Answers by respondents on opportunities for bioenergy trade

Country Code	Expertise	
GB	Ethanol	Give better support to cofiring in power plants
GB	Ethanol	Financial incentives Development of vehicles to take higher blends of biofuels
ZA	Ethanol	1. Domestic supportive policies that favor biofuel demand is an absolute necessity to develop domestic development. This will bring the production of feedstock, necessary supply chain development and infrastructure (adaptation of the transport fleets) in line for domestic supply and demand. As a result of growing demand global trade will come into play. However, South Africa favors a global environment without any support - this will benefit our industries to develop optimally. Currently the subsidized products from developed nations enter our markets at lower prices squeezing our industries out of production irrespective of the normal acceptable efficiencies of these industries. Global trade of subsidised commodities are hurting us.
MY	Biodiesel	Accelerating climate change will eventual increase awareness of urgent need for reduced fossil fuel consumption. More farming lands will become marginal due to changing weather patterns. Biofuel feedstock crops may play an important part in marginal land protection.
AT	Biodiesel	I don't think that real global trade will be fruitful for sustainable biodiesel development
NL	Biodiesel	Sustainability criteria for energy use.
ZA	Biodiesel	To secure food by intercropping and out grower schemes. By this uplifting the rural communities and their farmers. Provide a further income instead of one crop per year, they now have 3 crops, meaning three times their income per year.
FI	Biodiesel	Labour politics when domestic resources are favored
ZA	Biodiesel	Meaningful tax and investment incentives from governments.
NL	Wood Pellets	For wood pellets: developments regarding combustion (and gasification) technology. For all commodities: standardization of trade information.
SE	Wood Pellets	Transportation fuel from cellulose will, together with wood pellet market growth contribute to new markets for wood residues.
GB	Wood Pellets	Stable and consistent government policy within trading blocks.
DE	Wood Pellets	Increasing energy demand; electricity shortages; development of microgrids; liberalisation of electricy markets.
CA	Wood Pellets	strongly fluctuating coal and oil prices, as well as policies for biofuels coming into play.
NL	Wood Pellets	In addition to the above, also freight and currency markets both have a huge impact on the feasibility of import/export of any kind of biomass (agriwaste or wood pellets). Unfortunately one cannot influence them. But at least we can understand and anticipate. Many agricultural waste projects seem interesting as potential source for biomass. However, simple calculations show that this is far from feasible, mainly due to high freight costs. Even despite the favorable ROC system and ROC being at 50 pounds, and freight being low in comparison to the past years. In addition, the impact of 'new technologies' can be big as well.
NL	Wood Pellets	please make the rules simple and act consequent.
DE	Wood Pellets	High and strongly fluctuating natural gas prices
US	Wood Pellets	payment for ecosystem services would hopefully drive less conversion of forest or ag land to development. bioenergy feedstocks could be one form of a payment for

		ecosystem service.
GB	Wood Pellets	Carbon tax. Scrapping EU-ETS and the rest of the nonsense that passes for environment and energy policy at the moment. Not repeating the mistakes of Kyoto in Kyoto 2. Cap-and-trade is a bad way of pricing carbon and always will be. Most economists know that, but politicians don't want something more effective. I hope the USA, China and/or India will hold out against further stupidity at Copenhagen.
GB	Wood Pellets	Rising gas prices
US	Wood Pellets	There are so many opportunities with the Soviets, if they would just realize them.
		As the costs for fossil fuels climb and the want for less green house gases continues the some countries (US and Canada) will export less. Where as Africa, South America, Australia, New Zealand and Southeast Asia will continue to increase
US	Wood Pellets	Local rural jobs are created by decentralized feedstock production and processing, injecting capital into the base of the countries economy.
	Wood Pellets	Proper port facilities constructed to accommodate new bio fuels.
SE	General expertise	The concept of Sustainable development in general might be seen as a possible driver
GB	General expertise	Level playing field on taxation reduction related to CO2 reduction
		The use of ROCs (looks a workable policy)
		RTFOs currently a complete mess and probably more of a hinderance than a help.
NO	General expertise	Increasing prices for biofuels, lower shipping costs.
US	General expertise	Price of Carbon world wide

Appendix 9 Questionnaire

On the following pages, a copy of the questionnaire is shown. The questionnaire was online between February 12th and July 24th 2009.

Questions marked with a * are required

IEA Bioenergy Task 40 / UNCTAD / UNIDO survey on barriers and opportunities for international bioenergy trade

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Dear Madam, Sir,

We would like to invite you to participate in a joint survey of IEA Bioenergy Task 40, UNCTAD and UNIDO.

The aim is to get an up-to-date overview of what market actors currently perceive as major opportunities and trade barriers for the current and future development international bioenergy trade for three internationally-traded bioenergy commodities: 1) bioethanol 2) biodiesel 3) wood pellets.

It will take **approximately 10 minutes** to complete the questionnaire. Participation is possible until the 12th of April 2009.

Your participation in this study is completely voluntary. However, if you feel uncomfortable answering any questions, you can skip (most) questions or withdraw from the survey at any point.

Your survey responses will be treated as confidential and data from this research will be reported only in the aggregate. Your information provided in the multiple-choice questions will be coded and will remain confidential. All answers provided to open questions may be quoted, but always anonymously, unless you allow us explicitly to quote you.

If you provide your contact details, and provide intriguing answers, we may contact you for the possibility of an interview to elaborate further on your views. If you have questions about the survey or the procedures, you may contact Martin Junginger at +31-30-2537613 or by email at the email address specified below.

Thank you very much for your time and support. Please start with the survey now by clicking on the **Continue** button below.

1. Your background

Please provide your name (voluntary)

Please provide the name of your institution (voluntary)

Please choose the country in which (the head office of) your organisation is situated. (Choice is mandatory) *

-- Select --

What kind of an organization are you representing? (Choice is mandatory) *

- Industry
- NGO
- Government
- Academia
- Other

Are you a: (choice is mandatory) *

- Producer of biomass or biofuels
- Trader of biomass or biofuels
- Large-scale user of biomass or biofuels
- Other

In this survey, we focus on three spcific bioenergy commodities: 1) Bioethanol 2) Biodiesel and 3) Wood pellets. Please choose one of these commodities as your main area of expertise. This choice is mandatory.

If you do not have a special area of expertise, please indicate so as well. In this case, for all following questions, please motivate for which biomass commodity/commodities you deem a specific barrier relevant.

What is the main commodity you are involved with / your main area of expertise ? (choose 1, choice is mandatory) *

- Bioethanol
- Biodiesel
- Wood pellets
- None of the above / general expertise

2. Barriers to international bioenergy trade

In this section we will ask your view on the importance of different kinds of (possible) barriers for the international trade of bioenergy. In case you are not familiar with a category, please follow the link provided to read a short explanation.

2.1.Tariff barriers

Tariff barriers (import or export taxes of specific goods) and other policy measures designed to protect domestic markets can be a barrier to international trade. For an overview of known issues for bioenergy trade and tariffs, click here. Do you think that tariffs are (or can be) a barrier for the bioethanol, biodiesel or wood pellets. Are there cases where they may also stimulate trade?

	Major Barrier	Minor Barrier	Neutral	Minor Opportunity	Major Opportunity	I don't know	Not applicable or relevant
Import/export tariffs for bioethanol	○	○	○	○	○	○	○
Import/export tariffs for biodiesel	○	○	○	○	○	○	○
Import/export tariffs for wood pellets	○	○	○	○	○	○	○

Please explain your choice.

2.2 Technical standards

Currently, for different biomass commodities (bioethanol, biodiesel, wood pellets), various technical standards are being developed - for a short overview, click here. How can these standards in your view impede or facilitate international trade?

	Major Barrier	Minor Barrier	Neutral	Minor Opportunity	Major Opportunity	I don't know	Not applicable or relevant
Technical standards for bioethanol	○	○	○	○	○	○	○
Technical standards for biodiesel	○	○	○	○	○	○	○
Technical standards for wood pellets	○	○	○	○	○	○	○

Please explain your choice.

2.3 Sustainability criteria and certification

How could sustainability criteria for bioenergy commodities influence bioenergy trade? If you would like to know more about sustainability criteria, click here.

	Major Barrier	Minor Barrier	Neutral	Minor Opportunity	Major Opportunity	I don't know	Not applicable or relevant
Sustainability criteria for bioethanol	○	○	○	○	○	○	○
Sustainability criteria for biodiesel	○	○	○	○	○	○	○
Sustainability criteria for wood pellets	○	○	○	○	○	○	○

Please explain your choice.

2.4 Logistical barriers

Biomass logistics may play a pivotal role in international trade. Issues such as bad infrastructure, inadequate harbour facilities (e.g. handling equipment or lack of storage capacity) or the lack of appropriate pretreatment technologies may seriously hamper the further growth of international bioenergy trade. For more examples, click here. How important do you think are logistical barriers?

	Major Barrier	Minor Barrier	Neutral	Minor Opportunity (1)	Major Opportunity (1)	I don't know	Not applicable or relevant
Logistical barriers for bioethanol	○	○	○	○	○	○	○
Logistical barriers for biodiesel	○	○	○	○	○	○	○
Logistical barriers for wood pellets	○	○	○	○	○	○	○

(1) While we do not expect that logistical bottlenecks can in any way act as an opportunity for biomass/biofuels trade, we have included these options for consistency reasons. If you do choose them, please explain your choice below.

Please explain your choice.

2.5 Sanitary and phytosanitary measures

Sanitary and phytosanitary (SPS) measures mainly affect feedstocks which, because of their biological origin, can carry pests or pathogens. One of the most common form of SPS measure is a limit on pesticide residues. For an overview of bioenergy commodity-related issues, click here. Do you know of SPS measures for ethanol, biodiesel or wood pellets that may act as an barrier (or opportunity) for bioenergy trade?

	Major Barrier	Minor Barrier	Neutral	Minor Opportunity	Major Opportunity	I don't know	Not applicable or relevant
Sanitary and phytosanitary measures for bioethanol	○	○	○	○	○	○	○
Sanitary and phytosanitary measures for biodiesel	○	○	○	○	○	○	○
Sanitary and phytosanitary measures for wood pellets	○	○	○	○	○	○	○

Please explain your choice.

2.6. Lack of global classification and clear bioenergy trade statistics

There is a lack of a clear classification and statistics for biomass commodities within the multilateral trading system. In some cases, it is not known whether biomass fuels should be considered as an agricultural or industrial good. Trade classification may have important implications for countries' tariff reduction commitments as well as the national support schemes they can apply. For more information, click here.

How do you perceive the lack of clear classification and trade statistics for:

	Major Barrier	Minor Barrier	Neutral	Minor Opportunity	Major Opportunity	I don't know	Not applicable or relevant
Bioethanol	○	○	○	○	○	○	○
Biodiesel	○	○	○	○	○	○	○
Wood pellets	○	○	○	○	○	○	○

Please explain your choice.

2.7 Other barriers for bioenergy trade

Next to the barrier categories described before, we are very interested in your perception of possible other barriers for international bioenergy trade. Please use the room below to indicate what further barriers may be relevant.

3. Opportunities for international bioenergy trade

What do you deem the most important driver(s) for the growing international trade in the three selected bionergy commodities? You can select more than one driver.

	Bioethanol	Biodiesel	Wood pellets
High (and strongly fluctuating) oil prices	☐	☐	☐
High (and strongly fluctuating) coal prices	☐	☐	☐
Strong global policies on Greenhouse gas emission reductions	☐	☐	☐
Strong policies for the use of biomass for heating and electricity	☐	☐	☐
Strong policies on the use of biofuels for transportation	☐	☐	☐

Global or country-specific initiatives aimed at GHG emissions reduction	☐	☐	☐
Geopolitics and related energy-security concerns	☐	☐	☐
Rural development and the search for new markets for agricultural commodities	☐	☐	☐

Next to the drivers listed above, we are interested which other drivers you think will provide opportunities for increasing bioenergy trade. Please elaborate your views below

Thank you and possibility for further feedback

You have almost reached the end of this questionnaire. We have two more questions:

	Yes	No
Can we approach you by email in case we would like to clarify an answer you gave, or follow up in more detail on a specific point you raised? *	○	○
Do you want to receive the outcomes of this survey by email *	○	○

Please provide your email address:

You have reached the end of this questionnaire. On behalf of IEA Bioenergy Task 40, UNCTAD and UNIDO, **we would like to thank you very much** for your time and effort. Please **press on the continue button** a final time to save the survey results.

Please contact h.m.junginger@uu.nl if you have any questions regarding this survey.