Workshop IEA Task 40
-
25th of February 2008

Sustainable international bioenergy trade

Final Working Paper
-
Development of meaningful statistics for sustainable bioenergy trade and identification of other stakeholder's initiatives

Authors:

Richard Sikkema (Copernicus Institute),
Martin Junginger (Copernicus Institute)
Andre Faaij (Copernicus Institute)

Final version: 25 June 2008
Approved by: Bioenergy Task 40

Table of Contents

Executive summary

Sustainable management & rational use of natural biomass resources are important drivers for extended (trade) statistics on biofuels. Sustainability criteria & certification of biomass are under development through the EU Biofuels Directive and national initiatives within the EU (UK, Germany, The Netherlands, Finland) as well. Generally, *physical traceability* is required. Biomass trade for energy is an unrecorded market and involved market parties require transparent information. More comprehensive trade statistics support policy makers, scientific researchers and other stakeholders involved.

Generally, the collections of production & consumption statistics on biofuels are well organized and mapped. However, data on international trade of biofuels are still limited.

Renewable sources with stock changes, like solid biofuels & liquid biofuels (IEA Bioenergy Task 40, 2008) are mostly required to be recorded in order to track the growing international trade flows. A good example is the Joint Wood Energy Enquiry, which shows the significance of all cross border wood flows.

Conclusions: state-of-the art and new framework of trade data

Several international initiatives for improvement of bioenergy statistics are developed (Chapter 5). These activities are independently developed from each other, although some do cooperate & have coordination at an international level. More coordinating efforts seem justified to let IEA Bioenergy Task 40 prepare a courant package to improve bioenergy statistics. On the 25th of February a workshop was held at the IEA headquarters in Paris to discuss the issues of trade statistics of bioenergy (IEA Bioenergy Task 40, 2008). Only few trade data on biofuels are currently available within the Harmonized System, like fuelwood, charcoal and, since 2008 in the EU Combined Nomenclature, biodiesel (FAMAE) and bioethanol (ETBE).

After the inter secretariat working group (IWG) for improving national and international bioenergy statistics, the workshop participants identified the following generic elements:

- **Framework of international biomass trade**: identify existing (inter)national networks, link them and catalogue their databases. New networks may be created, too. Good examples are the IEA Bioenergy Tasks, and ISO's Technical Committees.
- **Consistent mapping of biomass (trade) statistics**: there is actual need for periodic questionnaires like the Joint Wood Energy Enquiry (UNECE/FAO). The set up of ad hoc studies like the Finnish and Austrian national biomass balances are needed, too.

Relevant elements for framework and mapping

According to the analysis in Chapter 6, the following elements are rather obvious:

1. **Country of origin**. The issue is the economic value of processed residues. If these are almost negligible (<10% economic value in respect to main product), the source of origin should be traced back to the processing (food/forest) industry and not back to the country in which the crops, respectively trees are grown (section 6.1).
2. **International trade flows.** Organizations dealing with global statistics of bioenergy, mostly compile production & consumptions figures (e.g. FAO, IEA, UNECE).

Lacking official trade statistics should be covered where possible or the subsequent international flows should be carefully mapped via questionnaires. One of the constraints is fuel ethanol trade: the traded products usually lack a clear specification for energy or non energy use. Countries should agree on one single specification standard (section 6.2). Wood pellets are an issue, too. Eurostat recently proposed to have a separate trade code for wood pellets as they are 'hidden' between other wood residues used as raw material for panel boards (section 6.3-6.5).

3. **Country of destination,** divided into a first and a second allocation (section 6.6). The *first allocation* of raw materials is complicated. To distinguish traded raw material trade for energy purposes from those for other uses is quite difficult. Energy markets are volatile and its further processing relies much on current market prices, storing facilities, etc. For example grains can be used both for feed (cereals) and fuel (bio-ethanol), but at the time of passing the border its 'fate' may be still unknown. The *second allocation* of residues may be overlooked. Production leads to main products & residues. It is relevant to trace where these remaining parts will stay for a second destination. For example, the use of (German) roundwood at a (German) sawmill may lead to the export of its residues & chips to Finland for further use in a plant for woodpulp production. This is called indirect trade.

Recommendations: needed exchange of initiatives via extra workshop

The European Commission services are generally concerned with bioenergy statistics as they are needed for setting renewable energy (biofuel) strategies, sustainability criteria, green public procurement policies and forest law enforcement, governance & trade (FLEGT). The latter concerns the issue of illegal logging. All these topics require monitoring and thus the need for statistics (IEA Bioenergy Task 40, 2008).

IEA Task 40 decided to keep the topic '**Bioenergy trade statistics'** on the agenda and is open towards further cooperation. This final paper is updated since the Paris workshop with new stakeholders & initiatives (based on **actual recommendations** in **Chapter 7**).

In order to facilitate the actual discussion of 'Bioenergy trade statistics' ànd to link relevant initiatives and proposed methodologies of involved stakeholders, IEA Task 40 proposes to wait for extra input. In 2008-2009 more actual information will be available from the following sources (stakeholders):

- Stake 1: Need and capacities of developing countries with regards to Energy Statistics (UNSD workshop organized by the Oslo Group)
- Stake 2: Issue paper on depletion of renewable resources (UNSD, delivered by London Group)
- Stake 3: Final submissions to the Harmonized System (World Customs Organization) and their impact on improving bioenergy trade statistics.
- Stake 4: First elaborations of the Special Report on Renewable Energy (IPCC) and possible upcoming issues with regards to the international trade flows of bioenergy.
- Stake 5: Actual discussion on EU Directive Renewable Energy (European Commission and other EU stakeholders).

List of contributors to IEA Task 40 workshop

Workshop program
9.30 Opening by:

- Andre Faaij (Leader IEA Bioenergy Task 40) – Chairman of Workshop
- Jean Yves Garnier (IEA – Energy Statistics Division, Head of Division)

10.00 Ralph Sims (IEA Renewables Unit) –
Biomass work program at the IEA: current and future
10.15 Zuzana Dobrotkova (IEA Energy Statistics Division) –
Renewables and Waste Statistics at the IEA
10.30 Break

11.00 Richard Sikkema (Utrecht University / Copernicus Institute) –
Improvement of trade statistics on bioenergy
11.15 Jussi Heinimo (IEA Task 40 / Finland) –
Methodological issues regarding indirect biofuels trade
11.30 Bo Hektor (IEA Task 40 / Sweden) – Bioenergy trade: a non existing phenomenon?
12.00 Room for questions and discussion
12.30 Lunchtime

14.30 Christopher Prins (UNECE Timber Section) –
UNECE / FAO Timber and Forestry Program
14.50 Florian Steierer (UNECE Timber Section / University of Hamburg) –
Improved information on wood energy: Production and Trade

15.10 Jeremy Wall (European Commission / DG Enterprise & Industry) –
European Commission services' inputs
15.30 France Lafargue (AFNOR) - Standardization for solid biofuels and solid recovered fuels

15.50 Jussi Ala-Kihnia (European Commission / Eurostat) -
General explanations on European trade statistics
16.00 Room for questions and discussions
17.00 End of workshop

Other participants

- Michel Francoeur (IEA Energy Statistics Division);
- Martin Junginger (IEA Task 40 / The Netherlands) – secretary of workshop;
- Wolfgang Bittermann (UN Energy Statistics; Biomass / Statistics Austria);
- Arvydas Lebedys (FAO / FOIM);
- Ann Christin Boeng (Norwegian Statistical Office);
- Reinoud Seegers (Dutch Statistical Office)
- Erik Tromberg (IEA Task 40 / Norway)
- Douglas Bradley (IEA Task 40 / Canada)
- Richard Hess (IEA Task 40 / United States)
- Tapio Ranta (IEA Task 40 / Finland)
- Trond Bratsberg (IEA Task 40 / Norway)
- Guislaine Veron Delors (Arvalis Institut du Vegetal)
- Frank Rosillo – Calle (IEA Task 40 / United Kingdom)

List of abbreviations (Glossary)

CBS:	Dutch Statistical Office (Centraal Bureau voor de Statistiek)
CHP:	Combined Heat Power (way of generating electricity together with heat)
CN:	Combined Nomenclature
CPC:	Central Product Classification
CPO:	Crude Palm Oil
EBB:	European Biodiesel Board (Brussels, Belgium)
EBIO:	European Bioethanol fuel association (Brussels, Belgium)
(S)EEA-E	(system of) Environmental Economic Accounting (UNSD; London Group)
ESCM:	Energy Statistics Compilers Manual
ETBE:	Ethyl tert-butyl ether (product of ethanol and isobutylene)
FAMAE:	Fatty acid mono alkyl ester (biodiesel)
FLEG(T)	Forest Law Enforcement, Governance and Trade
FAO:	Food and Agriculture Organization (Rome, Italy)
HS:	Harmonized System
IEA:	International Energy Agency (Paris, France)
IEA Task 40:	IEA special group on Sustainable Bioenergy Trade
IPCC:	Intergovernmental Panel on Climate Change
IRES:	International Recommendations for Energy Statistics (UNSD; Oslo Group)
IWG:	Intersecretariat Working Group (FAO, Eurostat, ITTO)
JODI	Joint Oil Data Initiative (UNSD)
JFSQ:	Joint Forest Sector Questionnaire (UNECE / FAO)
JWEE:	Joint Wood Energy Enquiry (UNECE / FAO)
LULUCF:	Land Use, Land-use change and Forestry
MBP:	mixed biomass pellets
MFA:	Material Flow Account (Eurostat)
MTBE:	Methyl-tert-butylether (biodiesel)
OECD:	Organization for Economic Cooperation and Development (Paris, France)
OGES:	Oslo Group on Energy Statistics (UNSD)
PRODCOM:	Industrial production database of European Union (Eurostat)
RCW:	Renewables combustibles and waste
REN 21:	Renewable Energy Network (21st Century)
SITC:	Standard International Trade Classification
SREN:	Special Report on Renewable Energy (IPCC)
SRF:	Solid Recovered Fuels
TWP:	Torrified wood pellets
UNCEEA:	UN Commission on Environmental Economic Accounting (UNSD; London Group)
UNECE:	UN Economic Commission on Economics (Geneva, Switzerland)
UNEP:	UN Environmental Program
UNIDO:	UN Industrial Development Organization
UNSD:	UN Statistics Division (New York, USA)
WTO:	World Trade Organization

1. Introduction

IEA Bioenergy Task 40 (Sustainable international bioenergy trade) has put the topic 'The development of meaningful statistics for sustainable bioenergy trade' in its 2007-2009 working program (Faaij, 2006). A first workshop for Dutch parties was held in the Netherlands in January 2007 and was followed by a second workshop for international parties on the 25th of February 2008 in Paris (IEA Task 40, 2008). This paper describes the outcome of the latter workshop and its proposed follow up in 2009.

The **aims of the IEA Task 40 February 2008 Paris workshop and this paper are**:

- To bring together various institutions currently involved in colleting international biomass trade statistics for information dissemination and exchange (see Chapter 4 plus the detailed Paris workshop report from "IEA Bioenergy Task 40, 2008".
- To summarize which data is currently collected, what is lacking and what data would be required to fulfill various needs from industry, academia and policy makers (see Chapter 5 and section 8.1 Conclusions).
- To explore the possibilities to set up a framework for the development of international biomass trade statistics and consistent mapping of international trade flows (see Chapter 6 and section 8.1 Conclusions).
- Identify international stakeholders involved. Include all relevant recommendations & possible steps into a feasible working plan. The working plan may be input for an additional workshop. See section Chapter 7 Wrap up & 8.2 Recommendations.

Within the context of green energy both renewable energy and renewable electricity are relevant. Due to the *scope of Bioenergy Task 40 (Chapter 2)*, the former is focused on.

Renewable energy statistics
Generally, the production & consumption figures for renewable energy are well known, whereas the renewable energy-trade lacks the availability of good quality data. In this paper, the trade of renewable energy is restricted to "physical biomass for energy end – use purposes". This biomass can be solid, liquid, gaseous or being mixed with non organic waste flows (see Chapter 3).

Renewable electricity statistics
Although green electricity is excluded from the physical context of Bioenergy Task 40, it is meaningful to show different ratios for green electricity. Although production, trade & consumption figures are well known, different assumptions & (inter) national definitions may lead to different ratios. Divergent definitions & assumptions lead to quite different outcomes per country. Within the actual international context of the Kyoto Protocol and relating IPCC Guidelines, countries may wish to have a more unified "regime" of renewable definitions. In order to show the ongoing discussion, Appendix B gives a short overview of renewable electricity definitions and their range.

2. *Why are bioenergy trade and its statistics important?*

A reliable supply of biomass and a reliable demand for bio energy is vital to develop stable market activities and international bioenergy trade. Bioenergy Task 40, a task under the IEA Bioenergy Agreement will contribute to the development of sustainable biomass markets on short and long term, from regional to global scale levels. The future vision of this task on biomass trade leads to "developing over time into a real commodity market and a long term securization of supply and demand in a sustainable way".

Biomass energy trade drivers (IEA Task 40)

Various drivers of international bioenergy trade can be distinguished (Faaij et al, 2006):

- A first driver is the **sustainable management and the rational use of natural resources**. Large-scale production and use of biomass for energy will require the use of (additional) land. The export market could be the trigger for obtaining benefits, when biomass production can be combined with better agricultural management, and, ideally, with restoration of degraded and marginal lands.
- A second driver is **cost effective emission reduction of greenhouse gasses**. At present, the demand for biomass is especially growing due to climate policies of various countries. Import is currently sometimes more attractive than exploiting local biomass potentials in situations where indigenous resources are too expensive.
- A third driver is **socio-economic development**. Many studies have indicated the potential positive links between developing bioenergy use and local development. Biomass markets can provide a sustainable source of income to rural communities.
- Last but not least, **fuel supply security** is another driver for biomass use and trade. Biomass diversifies the total portfolio of fuels used and imported by countries. This can reduce the risks of supply disruptions both in terms of quantity and in price. This argument is particularly valid for transport bio-fuels, as they replace oil imports.

Stakeholders participating in (bioenergy trade) statistics discussion

Sustainability criteria & certification of biomass are under development through the EU Biofuels Directive and voluntary national initiatives. So *physical traceability*[1] is required. The arguments in favor for more extended (trade) statistics on biofuels are derived from:

- **Policymakers (issues of legality and sustainability)**: an interesting debate is the certification of sustainable forest management (SFM) & legal use of harvested wood. On one hand the definition of legality looks problematic as there is no internationally agreed definition. On the other hand, defining sustainability has proved to be somewhat easier thanks to the internationally or regionally agreed criteria and indicators for SFM (certification schemes) (UNECE / FAO, 2006).
- **Industry (market support)**: the trade of biomass for energy is still an unrecorded market and involved market parties require transparent information. The European woodpellet market is such an example.
- **Academia (scientific research)**. Related to Kyoto goals and IPCC considerations it is necessary to analyze into detail the greenhouse balances of bioenergy chains.

[1] In case of "book and claim", negotiable certificates (between companies) are issued and physical traceability is not relevant as such (Cramer Commission, 2007).

3. What types of biomass sources are used for energy?

Based on recent IEA statistics (IEA Statistics, 2007), the following renewables combustibles & waste (RCW) categories may be distinguished:

- Renewable municipal waste.
- Solid biomass.
- Gas from biomass.
- Liquid biomass.

3.1 Renewable municipal waste

Municipal waste consists of a biodegradable part. Municipal waste products (including biodegradable hospital waste) are produced by the residential, commercial & public services sectors, and collected by local authorities for disposal in a central location. They can be directly combusted to produce heat and/or electricity.

3.2 Solid biomass sources

Solid biomass is defined as any plant or animal matter used directly as fuel or converted into other forms before combustion. Included are wood, vegetal waste (including wood waste and crops used for energy production), animal materials/waste, sulphite lyes (also known as black liquor, this is a sludge that contains the lignin digested from wood for paper making) and other solid biomass.

Charcoal produced is also included here. Since charcoal is a secondary product, its treatment is slightly different than that of the other primary biomass. Other supply (e.g. trade and stock changes) as well as consumption are aggregated directly with the primary biomass. In some countries, only primary biomass is reported.

3.3 Liquid biomass sources

Liquid biomass includes fuels and bioadditives such as biogasoline (bioethanol, biomethanol, biodimethylether etc), biodiesel and other liquid biofuels. Liquid biomass can be used for electricity/heat production as well as for biofuel production.

Electricity / heat production

An example of the use of liquid biofuels is the input of palm oil (deratives) in power plants. In 2005 about 375.000 tons of palm oil, other vegetal oil & fatty acids were used in the Netherlands as input for power plants (Junginger, 2006).

Biofuel production

The most common biofuels today are biodiesel (made form oleaginous plants such as rapeseed and sunflowers), and bioethanol (produced from sugar cane/beat and starch crops such as cereals). These two liquid transport fuels have the potential to replace diesel and petrol on a large scale. They can be used in the engines of modern cars (unmodified for low blends, or with cheap modifications to accept high blends) and distributed through existing infrastructures. Research is underway to develop “second

generation" production techniques that can make biofuels from woody material, grasses and other organic feed stocks.

3.4 Gaseous biomass sources

Biogas is derived principally from the anaerobic fermentation of biomass and solid waste and is combusted to produce heat and/or power. Included in this category are landfill gas and sludge gas (sewage gas and gas from animal slurries) and other biogas.

3.5 Overview of all sources

Based on the section 3.1 to 3.4, a selection of biomass resources has been illustrated.

Table 3.1 Examples of different kind of biomass resources & their potential energy use

	Renewable waste fractions	Gaseous biomass	Solid biomass	Liquid biomass
Heat & electricity production				
1. Waste Incineration	Biogenic fraction of waste	-	-	-
2. Cogeneration in power plants	-	-	Wood-residues, agricultural residues (in form of pellets)	Palm oil & other vegetal oil fractions
3. Woodstoves industry	-	-	Wood-residues woodpellets, charcoal	-
4. Woodstoves houses	-	-	Logs, wood-residues	-
5. Other biomass burning	-	-	Bone meal, black liquor (wood pulping residue), sawdust for cement-industry, waste paper burning	-
6.Combustion of biogas	Production of biogas (methane) via sewage sludge, manure, landfill waste & waste from food industry		-	-
Transportation fuels				
7. Biofuels	-		-	Bio-ethanol, biodiesel

- = not applicable

4. Who collects bioenergy trade & other statistical data?

Data collection can be divided into:
- Production & consumption (section 4.1)
- Trade data (section 4.2)

To show how figures from one sector (e.g. agriculture) are calculated to another (e.g. energy use), a separate section (4.3) of conversion factors has been added as well.

Observation: International organizations like IEA, FAO and UNECE collect production & consumption data for bioenergy. Trade data collection is currently limited (sections 4.1 & 4.2), although new initiatives on trade data collection are developed (Chapter 5).

4.1 Production & consumption data

The IEA receives per country (national statistical offices or other organizations responsible for official energy statistics) the renewable energy production & consumption figures, divided into:
- Renewable municipal waste
- Solid biomass
- Liquid biomass
- Biogas

More detailed & elaborated figures may be derived from specialized organizations.

Solid biomass & renewables municipal waste

Amongst others, Systemes Solaires (Eurobserver, 2006), elaborates a special solid biomass barometer in order to calculate the primary production of energy from solid biomass & renewable municipal waste in the European Union. On many official energy statistics, Eurostat, IEA and UNECE/FAO Timber Section work together. For renewable energy the main questionnaire is the joint annual questionnaire on renewables and waste. The production of solid biofuels is further divided into subcategories. The Eurobionet 2 study (Alankangas, 2007) defines the following solid biofuels specifications and classes (CEN/TS 14961)[2]:

1. Woody biomass
   - Forest & plantation wood
   - Wood processing industry, by products & residues
   - Used wood[3]
2. Herbaceous biomass
   - Agriculture & horticulture herb
   - Herb processing industry, by products and residues
3. Fruit biomass
   - Orchard & horticulture fruit
   - Fruit processing industry, by products & residues
4. Biomass blend & mixtures

[2] The solid biomass overview from Eubionet 2 is lacking any biomass from animal sources (e.g. bonemeal).
[3] Demolition wood is referred to in CEN/TS 14588

Liquid biofuels
Besides earlier mentioned organizations like IEA, biofuels figures may be derived from the European Biodiesel Board (www. www.ebb-eu.org) and the European Bioethanol Fuel Association (www.ebio.org) as well.

Biogas
Related figures are mostly collected by IEA Renewables Statistics, national agencies (e.g. SenterNovem in the Netherlands) and national statistical offices (the Netherlands: CBS)

4.2 Trade data

An comprehensive overview of of bioenergy trade flows seems quite limited, although several international organizations do collect statistical resources.
Further analysis may give an answer to the following questions:

- What kinds of bioenergy trade statistics are available?
- To which extent it will deal with solid, liquid and gaseous biomass?
- What can be learnt from these latter statistics?

Hereafter follows a summary of possible energy sources (see Appendix A for an extensive overview). We have divided them in 3 categories:

- Already covered by international bioenergy trade statistics
- Newly proposed international bioenergy statistics
- Other possible, but "hidden' categories

Existing bioenergy categories

- Fuelwood, listed in category 44 Wood and & articles of wood,
- Charcoal (Category 44), can be used as bio-organic filter as well.
- Peat (category 27) is a special case as in some countries it is regarded as a renewable source[4]. Please note that peat may be used in gardens as well ("garden fertilization").

Newly proposed bioenergy categories
Recently, the following categories were listed for their specific application for bioenergy:

- ETBE (EU), since 1st of January 2008 and MTBE (USA), since the 1st of January 2007, are separately listed in category 29 Organic Chemicals. ETBE is a product, made from (bio)ethanol and isobutylene. The ETBE biofuel can be mixed with petrol.
- FAMAE (EU) is taken into account as a separate trade code since the 1st of January 2008 and listed in Chapter 38 Miscellaneous chemical products. Similar to ETBE, FAMAE needs to be mixed with fossil diesel.
- Wood pellets are currently still qualified under Wood residues (Chapter 44 Wood and cork). The uptake of a separate code for wood pellets is proposed to happen on European level at the 1st of January 2009 (Eurostat, 2008). Uptake of a separate wood pellets code on world level (WCO) is foreseen at 2012. Please note that wood pellets may be used for 'animal bedding' as well. The current scientific developments of turning wood residues into 'Torrified Wood pellets (TWP) and pyrolyis oil are not yet taken into account, as they occur in a pilot stage.

[4] IPCC defines peat as fossil fuel, taking into account its emissions into the national carbon balance

Also other pellet categories can be significant for energy production

- Mixed biomass pellets (MBP), to be categorized under CN code 12.13.0000 (Chapter 12 Oil seeds, …straw and fodder)
- Post consumer waste pellets, to be categorized as 47.07.900 (Chapter 47 Woodpulp)

However, there is no direct need to create separate codes, as these latter pellets are more or less fully traded within the country of production (domestic use) and any possible international trade is just at an initial stage (Sikkema and Junginger, 2007).

Other possible bioenergy categories

Also other categories may exist of potential bioenergy sources, although their usual applications are outside the energy sector. E.g. palm oil is mainly used as raw material at the productions of margarines. Potential bioenergy sources are:

- Several kinds of seeds & oil residues (12 Oil seeds & oligeneous seeds), like rape seed & sunflower seeds. Both are basic ingredients for biofuel production.
- Ethyl alcohol or ethanol (22 Beverages) is used as ingredient for biofuel production.
- Crude Palm Oil (CPO) and components of palm oil kernels are categorized in at least four parts: Chapter 12 Oil Seeds (only USA, until 2006), Chapter 15 Animal and Vegetable fats, Chapter 23 Residues and wastes from food industry and Chapter 38. Miscellaneous chemical products ("Industrial fatty acids derived from palm kernels").
- Tall oil & residual lyes: Chapter 38 (Miscellaneous chemical products) contains three kinds of black liquor categories from the pulp & paper industry. All these liquid residues are generally used for energy-production.
- Municipal waste (Chapter 38), concerning the biogenic fraction (see section 3.1)
- Sewage sludge (also Chapter 38), as described in section 3.4.

4.3 Conversion factors energy sector

Generally, the following conversion factors are used throughout renewable statistics:

- **Heating values.** Input of renewables, based on the heating value per ton (e.g. wood pellets contain about 17,5 MJ/ton, compared to 37,5 GJ/ton for palm oil).
- **Ton oil equivalent.** Most IEA / OECD publications showing inter-fuel relations and projections present such information in a common energy unit, ton of oil equivalent (toe). A ton of oil equivalent is defined as 41,9 GJ.
- **Renewable electricity production.** IEA collect energy values in Terajoules (1 TJ = 2,38 x 10^{-5} Mtoe) of biomass inputs to both electricity production (1 TWh = 0,086 Mtoe) and generated heat. Therefore, the average actual efficiencies can be derived by plant type (electricity only, heath only, CHP).

From the Joint Wood Energy Enquiry (see also section 6.3) it is stated that common accepted conversion factors have to be established (IEA Task 40, 2008). UNECE recommended to set up a Task Force collecting and validating national level conversion factors for use in wood resource balances and outlook studies as well as to address conversion factors in the area of greenhouse gas exchanges. The Task Force should report back to the Joint FAO / UNECE Working Party on Forest Economics and Statistics in 2009 (UNECE / FAO, 2008b). Countries are encouraged to agree on and update a set of conversion factors (e.g. material input / product output) for forest based industries and energy conversions as these become available.

5. *Which organizations develop new initiatives on bioenergy trade statistics?*

The "Global Assessment on Energy Statistics and Energy Balances" analyses the current status of national implementation of energy statistics and energy balances. The outcome for energy from biomass is shown in the table here-after. Most information is collected on consumption, followed by production. Input/export statistics are less comprehensive (UNSD, 2008a).

Figure 5.1 Outcome of the global assessment for biomass for energy(UNSD, 2008b)

Table 10: Biomass

	Number of responding institutions (which marked at least one column)	Number of institutions collecting data	Types of data collection by the responding institution/agency: Business surveys	Household surveys	Specialized energy surveys	Administrative data	Data received from other institutions	Data compiled by your institution	Data disseminated by your institution
Biomass									
Production	55	36	10	5	**21**	11	24	28	32
Imports/exports	37	25	5	0	9	**18**	21	19	22
Consumption	63	51	15	21	**32**	11	23	29	38
Other statistics *	6	6	2	1	3	2	2	2	2

*It includes Transformation, Wood and paper (i.e. biomass but not energy-related), Biogas production, ethanol (production, stocks and imports).

With respect to the classification of products, the Harmonized System codes (HS) and the Standard International Trade Classification (SITC) seem to be the common classifications a global level. The Central Product Classification (CPC) and the Eurostat Prodcom list are also commonly used. CPC is more used in developing regions and economies, while Prodcom is more used in developed regions and economies (UNSD, 2008b).The Energy Statistics Manual (OECD, IEA and Eurostat) is the most commonly used publication, followed by the JODI manual and the UN handbooks on energy statistics.

This chapter gives a brief, but probably not complete overview of international coordinating work on actual developments of bioenergy statistics from United Nations (section 5.1), UNECE (5.2), Eurostat (5.3), IEA (5.4), World Customs Organization (5.5) and ISO (5.6).

5.1. United Nations organizations

The United Nations have developed several initiatives for revising (bio)energy statistics:

UNIDO (Industrial Development Organization) & UNEP (Environmental Program)
For joint work within UNIDO, a **Biofuels Team** is formed which will coordinate all focal area activities. The joint bioenergy unit with FAO will be strengtened and a more active involvement in the work of IEA bioenergy should be sought. In addition, UNIDO provide inputs on the technology section of BioenergyWiki (internet encyclopedia) and will participate in the preparation of REN 21 annual reports.
In February 2006, REN (**Renewable Energy Network**), opened its permanent secretariat offices in Paris. The secretariat is provided by UNEP and GTZ (GTZ is an international cooperation German enterprise for sustainable development with worldwide operations) and supported by IEA.

UNSD (UN Statistics Division)
The UNSD maintains responsibility for the production of global energy statistics data collection as well as the methodological development on energy statistics. There is close cooperation between UNSD and IEA/OECD. The UNSD maintains a database on energy statistics (http://data.un.org) and comprises the following biomass categories:

- Biodiesel
- Biogas
- Fuelwood
- Industrial waste
- Municipal wastes
- Other biomass and wastes
- Pulp and paper waste
- Vegetal waste

In recent years representatives form national statistical agencies have started to meet informally to address selected problems in statistical groups. Some of these groups have become formally known as “city groups” (UNSD, 2007).

- For **Environmental Economic Accounting**, the London Group was established in 1994. Broadly speaking, the topics covered by the Group tot date include, amongst others (a) Development of natural resource accounts in physical and monetary terms for mineral and energy, forests, water, fish and land; (b) Comparison of various methods for the valuation of natural resource stocks and environmental degradation; (c) Depletion of natural resources in physical and monetary terms and its proper treatment in the System of National Accounts. For further information see section 7.1.
- For **Energy Statistics**, the Oslo Group was established in 2006. The objective of the Oslo group on Energy Statistics is to build a multipurpose and coherent system for official energy statistics to monitor the yearly supply and use of energy in a country, and to address all user needs. “**Biomass and waste**” is one of the main topics of the Oslo group. This topic is coordinated by Mister Bitterman from *Statistics Austria* (Ljones, 2007). From 4 to 6 February 2008 (Vienna) a third meeting of the Oslo group focused on further work on revision of the UN manuals on Energy Statistics and setting up a list of objectives (UNSD, 2008a; OGES, 2008). See also section 7.1.

5.2. UNECE / FAO Timber Section

The geographical scope of UNECE/FAO Timber Section comprises western, central and eastern Europe, central Asia and North America – 56 countries in all. Statistics on production, trade, consumption and prices of forest products is an important element of the work area on markets and statistics.

Official statistics

The annually updated Joint Forest Sector Questionnaire (JFSQ) from Eurostat, ITTO, FAO & UNECE provides most recent, consistent and global data of timber flows[5]. All flows are based on the Harmonized System (HS; see Appendix A). For bioenergy purposes data on fuelwood removals and trade, wood residues production and trade as well as production and trade of chips and particles.

Informal markets & European Wood Balance

Informal markets for fuelwood trade between local, often private, producer/consumer as well as a product category "pellets" not being covered in timber trade statistics lead to underestimation of traded and consumed wood volumes (see section 6.5 as well).

In reaction to the ambitious renewable energy goals in Europe, as agreed by the European Council, the UNECE/FAO Timber Section in cooperation with Hamburg University and partners is currently elaborating a European Wood Balance. The objective is to improve information on wood flows for energy and material use within member countries and will provide policy makers with more specific information about the actual use of the forest resource and the potential contribution of wood for energy in the future (period 2010-2020). Results of the current work was recently discussed at the National wood resources balance Workshop (31 March – 1 April 2008; UNECE / FAO, 2008b).

Newly proposed mandate

The mandate of the UNECE/FAO Team of specialists on forest products markets and marketing (2008-2013) is proposed to change. One of the new expected major outputs is the participation in wood energy market studies in conjunction with the UNECE secretariat's long-term outlook study for wood energy. The concerned subgroup "Emerging Markets" contributes to work on improving the collection and dissemination of information on wood energy (Vlosky, 2008).

5.3. Eurostat's production and trade statistics

The aim of Eurostat is to provide the EU with a high quality statistical service in the field of Energy. The processes and projects address the following policy areas:

- Environmental impact of energy use
- Internal market for energy, including competition in network industries.

Priority EU & national policies (renewable energy sources, energy-environment integration, carbon emission inventories) will be particularly followed. Two EU Directives are quit relevant to cite:

[5] http://unece.org/trade/timber/mis/fps.htm

- Collect and report statistics that are monitoring the attainment of targets set in various sectored policies (e.g. Renewable Energy Sources White Paper; **Renewables Electricity Directive 2001/77/EC**).
- Eurostat is supporting improvements in methodology work (definitions, CN), like the availability of **liquid biofuel statistics**, as foreseen in **Directive 2003/30/EC**.

Here-after, available statistics for Production, Trade and Balance sheets are highlighted.

Production statistics
The database "PRODCOM" delivers the physical production of several types of national commodities in European countries, like the production of alcoholic liquors. For some specific commodities, the input of raw materials is being collected as well.

Trade figures.
Eurostat has installed a special **working group** "**Renewable Energy**". The group (coordinated by Nikolaos Roubanis of Eurostat) came up with new proposals at the 30th of November 2007, ending up into specific codes of bioenergy materials, valid for all European countries (Circa, 2008).

As stated before, the HS classification is the primary classification used in collecting trade statistics at the global level. With a view to improving the quality of energy statistics, the Commission, in collaboration with the member states, shall review the methodology used to generate renewable statistics. The commission shall present and disseminate the statistics generated from 2010 onwards (Roubanis, 2008).

Supply balance sheets for agricultural products
The working party "Crops products statistics" proposed at meetings in October 2001 and October 2002 to have manuals for balance sheets made on the categories Fats and Oils (Eurostat, 2002; Eurostat, 2001b). These sheets are accessible through the Eurostat website and combine all national volumes for a specific product (e.g. Maize), like production, export, import, consumption and storage changes.

Another basic but not completely developed concept of Eurostat is the so called 'Material Flow Account or MFA', as elaborated in Eurostat's Guide (Eurostat, 2001a). E.g. the Czech Republic made a MFA for the period 1990-2000 (Scasny et al, 2002). The MFA has two extra dimensions, compared to the supply balance sheet:
- Macro economic balance of costs; this may be derived from the National Accounts of a country.
- A national balance of GHG emission; this may be derived from IPCC's National Communications.

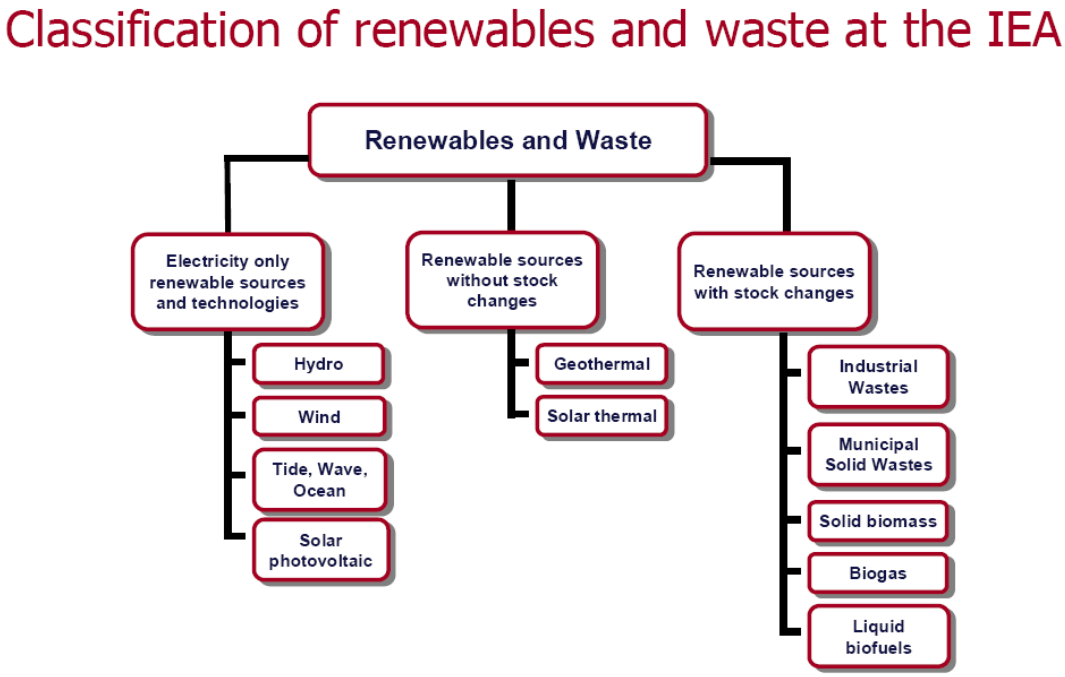
5.4. International Energy Agency division of renewable statistics

The IEA Division of Renewable Energy Statistichas also an international classification of renewables (electricity, no stock changes, stock changes), as explained by Zuzana Dobrotkova in the Paris workshop (IEA Bioenergy Task 40, 2008).

IEA classification

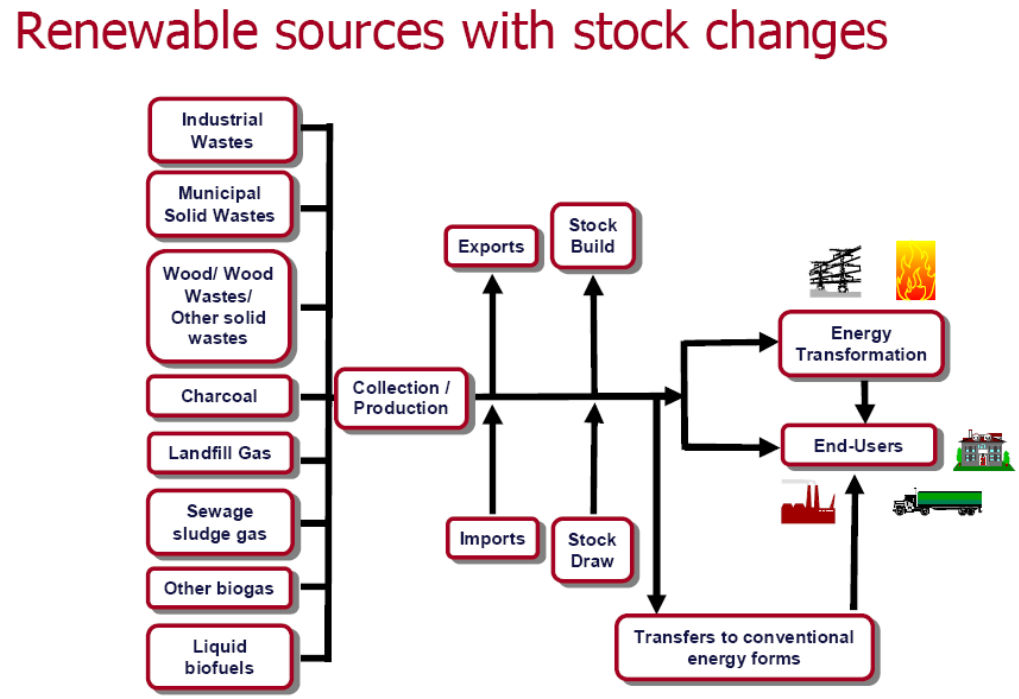
The following figure shows the (sub) classification of renewables and waste within IEA.

Figure 5.2 Classification of renewables and waste at the IEA (IEA Task 40, 2008)



*Following the IEA division, e*specially the category with stock changes (solid biofuels, liquid biofuels) can be traded (figure 5.3).

Figure 5.3 Classification renewable sources with stock changes (IEA Task 40, 2008)



Cooperation with other organizations (Energy Statistics Working Group)
Every five to six years the member countries of Eurostat, IEA and UNECE are invited to discuss energy statistics methodology in relation with the collection of energy data (Energy Statistics Working Group) The latest meeting was held in November 2004. New proposals are made to increase the comprehensiveness of the questionnaires, and suggestions are made on improving data quality, collection and reporting. Participants from member countries can discuss their problems and difficulties not only with the international organizations, but also with other participants. The Working group has distinguished five joint annual energy questionnaires:

- Oil,
- Gas,
- Solid fuels and Manufactured gases,
- Electricity and Heat and
- **Renewables.**

In addition the IEA is running the Implementing Agreement for a Program of Research, Development and Demonstration on Bioenergy, which activities are described on the IEA bioenergy web site at: http://www.ieabioenergy.com/

5.5. World customs organization's (WCO) coordinating role

The world customs organization (WCO) is the only intergovernmental organization exclusively focused on customs matters. With its worldwide membership, the WCO is now recognized as the voice of the global customs community. It is particularly noted for its work in areas covering, amongst others

- the development of global standards,
- the simplification and harmonization of Customs procedures,
- trade supply chain security
- the facilitation of international trade,

The WCO also maintains the international Harmonized System goods nomenclature, and administers the technical aspects of the WTO Agreements on Customs Valuation and Rules of Origin. Today, the WCO represents 172 Customs administrations across the globe that collectively process approximately 98% of world trade (WCO, 2008).

5.6. ISO's role on quality standards of solid (recovered) biofuels

Standardization is a major key for unlocking the fuel market and helping to reach the environmental and climatic goals of the European Commission. Standards, describing the properties and compositions of fuels, sampling and testing methods, will provide quality assurance, which is a major driver to expand the market The sets of European standards for solid biofuels and solid recovered fuels (SRF) will facilitate (Lafargue, 2008):

- A good understanding between sellers & buyers and a good communication with equipment buyers
- Purchase, trans-border movements, use and supervision
- The reporting on the use of fuels from renewable energy sources and environmental issues.

The ISO Technical Committee 238 (on Solid Biofuels) convened on the 21st to 23rd of May 2008 in Sweden (Sjoberg, 2008).

6. Which bottlenecks can be identified from case studies?

The following six sections illustrate the main bottlenecks in production (6.1), trade (6.2-6.5) and consumption (6.6) statistics for bioenergy used for electricity and biofuels.

6.1. Sustainability framework for residual flows (the Netherlands)

The Dutch framework (Commission Cramer, 2007) of sustainability requirements for bioenergy makes no distinction between residual flows and cultivation of crops. But it does make an exception for the category of residual flows representing a negligible economic value (<10%) of the main product (for instance agricultural or forestry products) and having no other useful applications. To this residual category flow category a limited number of criteria and indicators will be applicable.

For the purpose of this paper, it means that the original source of origin (agricultural land; forest land) needs not to be traced. Instead the source of origin will be the place where the residues have been produced. An example is wood pellets made from sawdust and wood shavings. For tracking the sustainability, the used wood residues should be traced back to sawmills, at which they are produced as byproduct next to main product of sawn wood. There is no need for tracing them back to the forests where the trees are grown.

Observation:

- The source of origin of (economic negligible) food- and/or wood-residues will be the processing industries (in a certain country) and thus not the country in which the crops and trees are grown on respectively agricultural land or forest.

6.2. Trade of liquid biofuels (IEA Bioenergy)

Data about fuel ethanol trade are imprecise due to various potential uses of ethanol (fuel, industrial or for beverage use) and also because the lack of proper codes for biofuels in the Harmonized System (HS) Commodity Description and Coding System (Walter, 2007). Estimates on ethanol trade (all grades) provided by FO Licht (2006) indicate that trade has almost steadily grown from about 3 billion liters (Giga liters) in 2000 to 6 billion liters in 2005. That is about 13% of the world production (45 Gl).

One of the constraints for fuel ethanol trade is the lack of a clear and single specification regarding the product, as different countries and some organizations have their own standards. Import duties & fuel taxes lead to extra complications, as importing countries may stimulate raw materials (and semi-finished products) and process these into finished products, whereas exporting countries encourage the trade of finished products.

Observations:
Standardization is crucial both

- to set the main parameters regarding fuel characteristics (e.g. maximum water content) and
- to unequivocally define the products that would be treated under certain trade rules (e.g. different duties imposed for denaturized & un-denaturized ethanol in EU, although both products can be used as fuel).

6.3. Trade of solid biomass (Eubionet)

Considering biomass in general, it can easily be concluded that the majority of biomass trade takes place in the form of raw materials or further processed solid products instead of fuels. Raw biomass is usually traded for food, fodder, or raw material purposes.
The most traded solid biomass is pellets, now regarded under the same CN code as wood Residues: 44.01.3000. Consequently, it is not possible to identify wood pellets used for energy, while the other part of this code consist of wood residues used for further processing into wood panels or wood pulp.

Observation:
- Own trade codes (Combined Nomenclature; Harmonized System) would be needed for energy products like wood pellets.

6.4. Trade of wood for energy (UNECE / FAO)

The UNECE/FAO Timber Section collects and provides statistics on production, trade, consumption and prices of forest products. The level of detail and structure of items in the ***Joint Forest Sector Questionnaire (JFSQ)*** are derived from he Harmonized System**.** 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 (WCO, 2008). The Inter secretariat Working Group (IWG) on forest sector statistics (FAO, Eurostat, ITTO) will attempt to have wood pellets, recovered wood and wooded houses added to the HS 2012 revisions (UNECE Secretariat, 2008).

A ***Joint Wood Energy Enquiry*** (JWEE) was designed (by: UN ECE, FAO, IEA & EU) to overcome missing information on the role of wood for energy generation. The structure (derived from the German Wood Balance scheme from Professor Mantau) was modified to link with International Energy Agency (IEA) statistics – for which reason black liquor and recovered wood have been included, too. Correspondents to the enquiry were encouraged to include best national data available. The result for USA, Canada and 12 European countries showed (Steierer, 2007; UNECE/FAO Timber Section, 2007) that most of the wood used for energy arises during the processing, or after the use, of forest products such as sawn wood, panels and paper. Wood energy supplied directly from the forest is smaller but plays an important role, especially in the European countries.

Main Observations:
- Wood used for energy generation is sometimes not captured by production (=roundwood harvest) and some specific trade statistics.
- Harvested wood volumes, like the informal fuelwood market for households, seem to be significantly higher than reported by international statistics.
- Wood pellets, may be underestimated, as separate trade classification is lacking.

6.5. Trade of wood pellets for energy (Pellets@las)

Global pellet production & consumption are currently analyzed in a broad European project, called Pellets@las (www.pelletatlas.info). Early figures for 2006 showed 4,3

million ton production of woodpellets in Europe, plus an external net trade of about 0,6 million ton. Total European consumption reached almost 5,0 million ton of wood pellets, thus 12% originates from non European sources. The biggest overseas supplier is Canada.

Since May 2007, actualization of the European pellet database occur amongst others through enquiries with producers, traders & consumers of (wood)pellets per country (Sikkema and Junginger, 2007).

Observations so far:

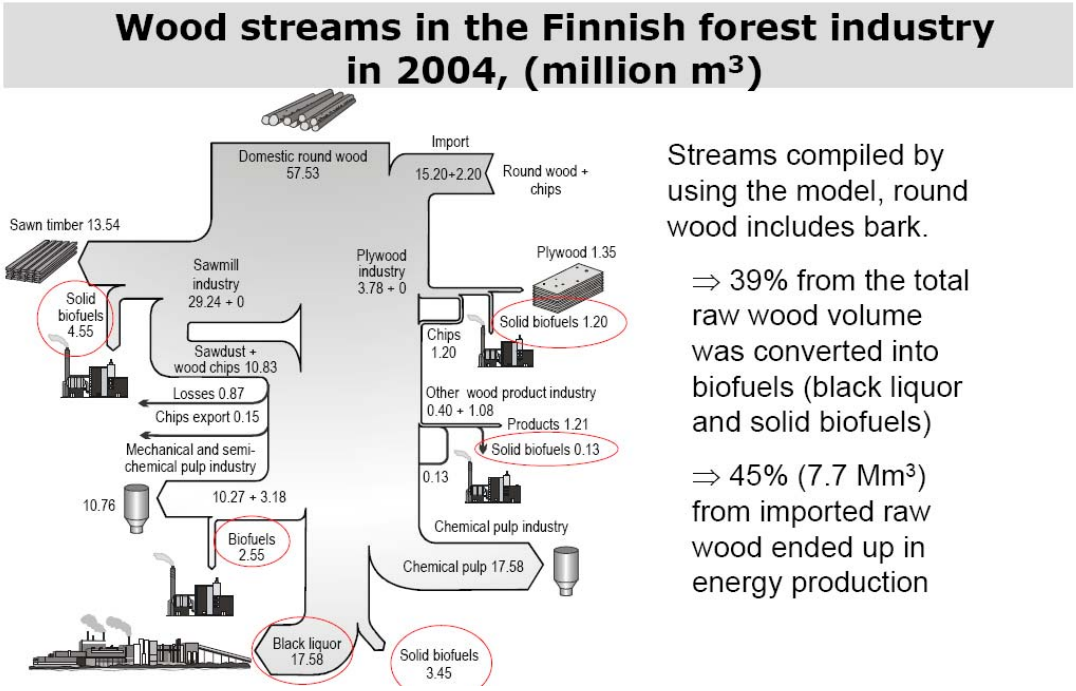
- Although the results are preliminary, enquiries with Dutch traders of wood pellets result in overestimations of trade. Upon arrival in Dutch harbors, pellets are immediately re-exported to other countries without officially passing Dutch borders.
- The trade of pellets within Netherlands is passing by several traders & retailers domestically, so double counting will happen via enquiries of all involved parties.

6.6. Utilization of wood (products) for energy in Finland

In a detailed study for Finland (Heinimo, 2008), Foreign Trade Statistics of Finland were analyzed over the year 2004. Generally, the information the Finnish statistics provide can be considered quite reliable. However, it is not possible to obtain a clear view on streams of international woody biofuels trade directly from the Foreign Trade Statistics.

Hereafter, the graphic outcome of the Finnish analysis is shown. A similar analysis has been made for the Austrian wood flow in 2005 (Hagauer and Lang, 2008).

Figure 6.1 Overall Finnish wood balance – 2004 (source: Heinimo, 2008).



The main weaknesses in the Finnish 2004 statistics are:

- **Indirect trade**. Statistics do no differentiate end purposes of the materials between energy and raw materials use. A problematic point is related to the raw material of wood pellets. Almost 20% of the raw material of wood pellets originates from imported wood. The foreign raw materials in pellet production were excluded from the calculations of the balances of international biofuels trade (see also section 5.6).
- **One trade code for separate end uses.** Various products can be included in a CN (Combined Nomenclature) code. An example is ethanol, which is used as transportation fuel and for raw materials purposes in chemical industry. Despite the large number of CN codes, it seems that there is still need for new ones. E.g. wood pellets are recorded under de the same CN code for wood by products. Several products of the chemical industry, including ethanol, are recorded under the same CN code (see Appendix A).
- **Different trade codes for similar energy purposes.** Tall oil & tall oil products can be used in energy production. However, they can be recorded under 3 separate CN codes. In addition, CN for tall oil (pitch) is included other chemical products as well.
- **Threshold values.** The threshold values of intra EU trade also bring uncertainty to the statistics. A company does not need to report its foreign trade for the statistics if the annual value of intra EU trade undercuts the threshold value. Thus occasional and small scale foreign trade is excluded from the statistics.

Observations:

- Indirect biomass trade flows should be allocated more precisely to its final destination, whether energy (product) use or not
- Statistics do not explicitly allocate bulk sources (e.g. cereals) to food or fuel destinations, as this is practically impossible.
- Similarly, bulk resources like wood residues are not explicitly traded for forest products (wood, pulp & paper) or fuel destinations.

7. Wrap up of actual recommendations for bioenergy statistics

Based on **actual recommendations from international actors** (stakeholders), relevant findings are identified for the topic of "Developing meaningful bioenergy statistics". According to Chapter 2, the three "stakeholders" policymakers, industry and scientific researchers have their interest in international bioenergy statistics (section 7.1 to 7.3).

7.1 Findings for policymakers (UNSD city groups)

The following recommendations are recently discussed within UNSD, of which the first item is linked to the London Group and the others to the Oslo Group (see section 5.1):

- Developing bridge tables between energy balances, energy accounts and national accounts, plus a contribution to *a System of environmental Economic Accounting for Energy* (SEEA-E). Urgent matters like depletion of natural resources and environmental degradation are covered by this initiative. An issue paper on depletion of renewable sources is scheduled **for August 2008** (London Group, 2007).
- More attention should be paid to the needs and capabilities of developing countries. The UNSD takes the initiative to organize an *International Workshop on Energy Statistics* (tentatively the **4th Quarter of 2008**).
- Endorsement to develop *International Recommendations for Energy Statistics* (IRES) and to submit IRES to the UN Statistical Commission for adoption in **2010**. IRES should focus on basic energy statistics and energy balances.
- Preparation of a follow up publication *Energy Statistics Compilers Manual* (ESCM) as soon as possible (ideally by the **end of 2010**) to provide additional guidance to data compilers by describing good practices and discussing matters not covered in IRES

Last but not least, the current discussion on the EU directive Renewable Energy will get further clarification around the **4th quarter of 2008.** See, amongst others, the website www.euractiv.com for more actual information on the topic of renewable energy.

7.2. Findings for industry (Eurostat, WCO, UNECE/FAO)

As an example for solid biofuels[6], the Joint working party on forest economics and statistics draws attention to specific issues where guidance (on markets and statistics) is needed (UNECE / FAO, 2008b; UNECE / FAO, 2008a):

- Changes to the global *Harmonized System (**submissions by the end of 2008; final incorporation in 2012**)* to show the role of wood in energy supply and in terms of mobilizing more wood for energy and industrial processing (Eurostat, WCO).
- Active participation into wood energy market studies in conjunction with the UNECE secretariat's *long-term outlook study for wood energy* (section 5.2). This study is quit similar to the earlier made European Forest Sector outlook study (EFSOS) for 2020.
- Collection and validation national level *conversion factors* for use in wood resources balances and outlook studies as well as to address conversion factors in the area of

[6] The relationship with stakeholders and initiatives on liquid biofuels needs more attention and consequently to be incorporated in this paper too.

greenhouse gas exchanges (section 4.3). A report should be prepared for the Joint FAO/UNECE Working Party on Forest Economics and Statistics **in 2009**.

- At their latest meeting in May 2008 (Jonkoping Sweden), the IEA Bioenergy Task 40 members wish to have a certain role for the industry into developing further statistics on bio-energy trade.

7.3. Findings for scientific research (IPCC)

In April 2006, the IPCC considered the possible contribution of the use of renewable energy sources to the mitigation of climate change (Moreiro, 2008) and agreed to hold a scoping meeting for a possible *Special Report on Renewable Energy* (SREN). The participants of the recently held scoping meeting concluded that a special report would be an appropriate choice and provide a better understanding of, amongst others (IPCC, 2008):

- Resources by region and impacts climate changes on these resources;
- The impacts on global, regional and national energy security.

The Special Report will be **started in 2008** and could be finalized by **the end of 2010**.

This SREN exercise looks quit similar to IPCC's scientific mission on Land Use, Land Use Change and Forestry (LULUCF). To coordinate the international debate on LULUCF and climate change, the following reports have been made:

- Special Report LULUCF (Watson et al, 2000);
- Good Practice guidance for LULUCF (Penman et al, 2003).

Both reports focused on forestry issues, and further contained an elaborate discussion about the international trade flow of wood products and its impact on climate change.

8. Discussion (proposals for further improvement)

Section 8.1 (Conclusions) summarizes currently collected data, lacking information and data required to fulfill the needs of policy makers, industry and academia. Section 8.2 (Recommendations) discusses how **to close gaps** and comes up with possibilities to set up a framework of **international biomass trade statistics and consistent mapping of trade**. The focus of this paper is put both on solid and liquid bio-energy (section 5.4).

8.1. Conclusions (state-of-the art and new framework trade data)

Generally, the collections of production & consumption statistics on biofuels are well organized and mapped (Chapter 3 and 4). However, data on international trade of biofuels are still limited and need to be improved (Chapter 5). From the presentation (IEA Bioenergy Task 40, 2008) of IEA's division on Renewables and Waste Statistics (see also section 5.4), it is further made clear that: *Renewable sources with stock changes* (solid & liquid energy flows) are mostly required to be recorded in order to track the growing international trade flows. A nice example is the Joint Wood Energy Enquiry, which shows the significance of all cross border wood flows throughout Europe.

Covered and uncovered trade categories

Based on the Chapters of the Combined Nomenclature for international trade reporting (CN; see Appendix A), the following division was made (IEA Bioenergy Task 40, 2008):

- **Recorded categories of renewable sources**: examples are ETBE (bioethanol), FAMAE (biodiesel or solvent), fuelwood and charcoal.
- **Newly proposed categories of renewable sources**: examples are wood pellets and mixed biomass (agro) pellets which volumes are put under more general (non energy) trade codes of wood waste, respectively cereal straw & husks. As to the former, Eurostat recently proposed to have a separate code in Europe for wood pellets from the 1st of January 2009 (Eurostat, 2008), as its volumes are largely, internationally traded and used for the production of electricity (Sikkema and Junginger, 2007).
- **Potential categories of bioenergy statistics**. When crossing borders, traded items within the CN could have either energy or non-energy destinations: examples are vegetal products (maize, rapeseed), animal or vegetal fats (palm oil), prepared food stuffs (like ethanol) and several types of industrial wood residues (sawdust, shavings).

Framework and mapping of biomass trade statistics

After the inter secretariat working group (IWG) for improving national and international bioenergy statistics, the workshop participants identified the following generic elements:

- **Framework of international biomass trade**: identify existing (inter)national networks, link them and catalogue their databases. New networks may be created, too. Good examples are the UNSD initiatives for Energy Statistics (see section 8.2).
- **Consistent mapping of biomass (trade) statistics**: there is actual need for periodic questionnaires like the Joint Wood Energy Enquiry. The set up of ad hoc studies like the Finnish and Austrian national biomass balances are needed as well.

Relevant elements within framework and mapping

According to the analysis in Chapter 6, the following elements are rather obvious:

1. **Country of origin**. The issue is the economic value of processed residues. If these are almost negligible (<10% economic value in respect to main product), the source of origin should be traced back to the processing (food/forest) industry and not back to the country in which the crops, respectively trees are grown (section 6.1).
2. **International trade flows.** Lacking official trade statistics should be covered where possible or the subsequent international flows should be carefully mapped via questionnaires. One of the constraints is fuel ethanol trade: the traded products usually lack a clear specification to determine their possible application for energy uses. Countries should agree on one single specification standard (section 6.2). Wood pellets are an issue, too. Eurostat recently proposed to have a separate trade code for wood pellets as they are 'hidden' between other wood residues used as raw material for panel boards (section 6.3-6.5).
3. **Country of destination,** divided into a first and a second allocation (section 6.6). The *first allocation* of raw materials is complicated. To distinguish traded raw material trade for energy purposes from those for other uses is quite difficult. Energy markets are volatile and its further processing relies much on current market prices, storing facilities, etc. For example grains can be used both for feed (cereals) and fuel (bio-ethanol), but at the time of passing the border its 'fate' may be still unknown. The *second allocation* of residues may be overlooked. Production leads to main products & residues. It is relevant to trace where these remaining parts will stay for a second destination. For example, the use of (German) roundwood at a (German) sawmill may lead to the export of its residues & chips to Finland for further use in a plant for woodpulp production. This is called indirect trade.

8.2. Recommendations for a follow up

The European Commission services are generally concerned with bio-energy statistics as they are needed for setting renewable energy (biofuel) strategies, sustainability criteria, green public procurement policies and forest law enforcement, governance & trade (FLEGT), the latter concerns the issue of illegal logging. All these topics require monitoring and thus the need for statistics (IEA Bioenergy Task 40, 2008).

IEA Task 40 decided to keep the topic '**Bioenergy trade statistics'** on the agenda and is open towards further cooperation. This final paper is updated since the Paris workshop with new stakeholders & initiatives (based on **actual recommendations** in **Chapter 7**).

In order to facilitate the actual discussion of 'Bioenergy trade statistics' ànd to link relevant initiatives and proposed methodologies of involved stakeholders, IEA Task 40 proposes to wait for extra input. In 2008-2009 more actual information is available from:

- Need and capacities of developing countries with regards to Energy Statistics (UNSD workshop organized by the Oslo Group).
- Issue paper 'Depletion of renewable resources' (UNSD, delivered by London Group).
- Final submissions to the Harmonized System (World Customs Organization) and their impact on improving bio-energy trade statistics.
- First elaborations of the Special Report on Renewable Energy (IPCC) and their possible upcoming issues with regards to the international trade flows of biomass.
- Discussion on EU directive Renewable Energy (see also www.euractiv.com).

Appendix A Overview possible bio-energy trade categories (2007)

In the Combined Nomenclature (2007), about 15.000 headings are organized in five hierarchical levels (source: Eurostat):

- Level 1: sections coded by Roman numerals (e.g. section II Vegetable products)
- Level 2: chapters identified by 2 digit numerical codes (e.g. Chapter 44 Wood & articles of wood; charcoal)
- Level 3: headings identified by 4 digit numerical codes
- Level 4: Harmonised System (HS) subheadings identified by 6 digit numerical codes
- Level 5: Combined Nomenclature (CN) subheadings identified by 8 digit numerical codes

Trading chapters	Trade statistics	Digit name	EU trade	US trade
Trade Chapters (Level 2):	CN subheadings (Level 5)	**Sources:**	(Eurostat, 2007)	Export: US Census Bureau, 2007; Import: US ITC, 2007
12 Oil seeds and oleaginous seeds; …; straw & fodder	12.05.1000	Rape or colza seeds (1st example)	+	+
	12.06.0000	Sunflower seeds (2nd example)	+	+
	12.07 [1)]	Other oil seeds	+	+
	12.13.0000	Cereal straw and husks (unprepared, pellets, etc)	+	+
15. Animal or vegetable fats, oil, etc & waxes	15.11.1000	Palm oil crude	+	+
	15.11.9000	Palm oil other	+	+
	15.13.2100	Palm kernel or babussu oil crude	+	+
	15.13.2900	Palm kernel or babussu oil other	+	+
22. Beverages, spirits & vinegar	22.07.1000	Ethyl alcohol (ethanol)	+	+
	22.07.2000	(denaturated & naturated)	+	+
23. Residues & waste from the food industries; prepared animal feed	23.06.6000	Oil cake & other solid residues ….of palm nuts or kernels	+	+
27. Mineral fuels	27.03.000	Peat , incl. peat litter [2)]	+	+
29. Organic chemicals	29.09.1910	ETBE (made using ethanol)	+ (per 1/1/2008 (Packbier, 2007) e.g. MTBE	-
	29.09.1940	MTBE		+ e.g. ETBE
	29.09.1990	Others		

Trading chapters	Trade statistics	Digit name	EU trade	US trade
Trade Chapters (Level 2):	CN subheadings (Level 5)	**Sources:**	(Eurostat, 2007)	Export: US Census Bureau, 2007; Import: US ITC, 2007
38. Miscellaneous chemical products	38.03.0000	Tall oil [3)]	+	+
	38.04	Residual lyes from wood pulp production [3)]	+	+
	38.07	Wood tar (oils)….based on ….vegetable pitch	+	+
	38.23.1920	Industrial fatty acids derived from coconut, palm kernel of palm oil	-	+
	38.24.9091	FAMAE (biodiesel)	+ per 1/1/2008 (Packbier, 2007)	-
	38.25.1000	Municipal waste	+	+
	38.25.2000	Sewage sludge	+	+
44. Wood & articles of wood; wood charcoal	44.01.1000	Fuelwood	+	+
	44.01.2100	Softwood chips	+	+
	44.01.2200	Other woodchips	+	+
	44.01.3000 (also 3010 & 3090)	Sawdust, wood waste & scrap (in pellets etc)	+	+
	44.02.1000	Charcoal from bamboo	+	+
	44.02.9000	Charcoal other	+	+
	44.05.0000	Wood wool, wood flour	+	+
47. Pulp of wood or of other fibrous cellulosic material	47.07.9000	Other, including unsorted waste & scrap	+	+

Notes:
1) US export classification contained in 2006 a code for palm nuts & kernels: 12.07.1000
2) Peat fuel: In some countries, like Ireland & Finland, it is being regarded as slowly growing biomass. In IPCC guidelines, however, it is administrated as fossil fuel.
3) Better known as “Black liquor” in the pulp & paper industry. See also definitions below (source: Wikipedia).

Background information on tall oil & black liquor:

- **Tall oil**, also called liquid rosin or tallol, is a viscous yellow-black odorous liquid obtained as a byproduct of the Kraft process of wood pulp manufacture. The name originated as Anglicization of Swedish "tallolja" ("pine oil").
- **Black liquor** is a recycled byproduct formed during the Kraft process, the sulfate method of chemical pulping of wood in the papermaking industry. In this process, lignin is separated from cellulose, with the latter forming the paper fibers. Black liquor is the combination of the lignin residue with water and the chemicals used for the extraction.

Appendix B. IPCC umbrella & definition of green electricity.

As consequence of the Kyoto Protocol, the IPCC 2006 guidelines take only the national production of electricity into account in order to calculate the national carbon balance. Therefore imports of electricity may be left out of the renewable electricity definition. In order to show the different outcomes of renewable electricity share, a study of the Dutch statistical office is described (Segers, 2006).

IEA definition of renewable electricity
The IEA definition follows the IPCC guidelines, regarding the definition for renewable energy: production of renewable electricity devided by the total electricity production. In 2005 the share of renewables was 7,4%.

Alternative definitions
However, more definitions for renewable electricity are available. In all these alternative definitions the total electricity production is replaced by the total electricity consumption, thus including net imports of electricity. This leads to a 1,1% lower renewable energy share.

Other changes are caused by:

- Inclusion of non biogene fraction (Eurostat): this leads to a higher (+1,2%) share of renewables in Europe in 2005.
- Replacement of the renewable electricity component by the renewable consumption compoment. As Europe had in 2005 a net export of its renewable electricity, the renewable share is about 0,2% lower.

Table B shows the different outcomes of the various definitions (Segers, 2006).

Table B. Overview of international definitions for renewable electricity production

	International Energy Agency	EU guidelines renewables (2001/77/EG)	Eurostat	National definitions per country
Renewable electricity production in the EU (2005)	7,4%	6,3 %	7,5 %	6,1%
Remarks (between brackets the change of renewable electricity share)	Conform the IPCC definition	Incl. net imports of electricity (-1,1%)	Incl. net imports of electricity (-1,1%) Incl. “non biogenic” renewables (+1,2%)	Incl. net imports of electricity (-1,1%) Incl. net exports of renewable energy (-0,2%

Appendix C. Chronological overview of workshops and seminars.

Appendix C Chronological overview of workshops and seminars

	Date	*Organisation*	*Place*	*Country*	*Participants / topics*	*Sources (see Reference list)*
1	2001, 4-5 October	Eurostat	Luxembourg	Luxembourg	Working Group "Crop products statistics"	Eurostat, 2001b
2	2002, 9-10 October	Eurostat	Luxembourg	Luxembourg	Working Group "Crop products statistics"	Eurostat, 2002
	2004, 16-17 Nov	IEA	Paris	France	Energy Statistics Working Group (ESWG) meeting	Not citated in paper
3	2006, 5 October	UNECE/FAO	Geneva	Switzerland	Policy Forum	UNECE / FAO, 2006
	2007, 27 Feb–2 Mar (2006, February)	UN ESC	(Oslo)	(Norway)	Statistical Commission (38th Session) (Report of 1st meeting of OGES)	Not citated in paper
4a	2007, 26-30 March	UNSD	Johannesburg	S. Africa	London Group Environmental Economic Accounting	London Group, 2007
4b	2007, 5-6 July	UNSD	Delhi	India	Oslo Group on Energy Statistics (2nd meeting OGES)	Ljones, 2007
5	2007, 30 November	Eurostat	Luxembourg	Luxembourg	Working Group "Renewable energy statistics"	Circa, 2008
6	2008, 4-6 February	UNSD	Vienna	Austria	Oslo Group on Energy Statistics (3rd meeting OGES)	OGES, 2008
7	2008, 25 February	IEA Task 40	Paris	France	IEA Task 40 members and RE experts	IEA Task 40, 2008
8	2008, 26-29 February	UNSD			Statistical commission (39th session)	UNSD, 2008b
9	2008, 27 February	Eurostat	Luxembourg	Luxembourg	Customs Code Committee	Eurostat, 2008
10	2008, 31 March - 1 April	UNECE/FAO	Geneva	Switzerland	National wood resource balance workshop	UNECE / FAO, 2008a
11	2008, 2-3 April	UNECE/FAO	Geneva	Switzerland	Joint WP on forest economics & statistics (30th session)	UNECE / FAO, 2008b
12	2008, 9-10 April	IPCC	Budapest	Hungary	28th Session (Special Report Bioenergy)	IPCC, 2008
13	2008, 21-23 May	ISO	Jonskoping	Sweden	Technical Committee 238 Solid Biofuels (1st meeting)	Sjoberg, 2008

List of references

Alankangas, E., A. Heikkinen, T. Lensu and P. Vesterinen (2007) Biomass fuel trade in Europe. Eubionet **Volume**, DOI: EIE/04/065/S07.38628

Circa (2008). Working Group "Renewable Energy Statistics", Luxembourg, European Commission / DG Business Statistics.

Commission Cramer (2007). Testing framework for sustainable biomass. Final report from the project group "Sustainable production of biomass". C. E. E. Transition.

Eurobserver (2006). Solid biomass barometer. Systemes solaires**:** 41-58.

Eurostat (2001a). Economy wide Material Flow Accounts and derived indicators. A methodological guide. Luxembourg, Eurostat**:** 92 pages.

Eurostat (2001b). Handbook to compile supply balance sheets (general information; concepts). Working Group "Crop products statistics"", EEA Agricultural Statistics Committee.

Eurostat (2002). Handbook for compiling supply balance sheets (oil seeds and oligeneous fruit; vegetable fats and oils; oilcakes). Working group "Crop products statistics". Luxembourg, Statistical office of the Europan Communities.

Eurostat (2007) Metadata Combined Nomenclature 2007. Europa RAMON Classification Detail List **Volume**, DOI:

Eurostat (2008). Submission of wood pellets code to Customs Code Committee. Tariff and statistical nomenclatura section, Luxembourg, CE / Eurostat.

Faaij, A., P.P. Schouwenberg and M. Junginger (2006). Task 40: sustainable international bioe-energy trade (securing supply and demand). Planning for the new triennium 2007-2009. Exco58. Stockholm, Sweden, IEA Bioenergy.

Faaij et al, A., P.P. Schouwenberg and M. Junginger (2006) Task 40: Planning for the new triennium 2007-2009. IEA Task 40 **Volume**, DOI: ExCo58

Hagauer and Lang, D. a. B. (2008). Basic Energy Statistics - Biomass. Oslo Group on Energy Statistics (third meeting), Vienna.

Heinimo, J. (2008). "Methodological aspects on international biofuels trade - international streams and trade of solid and liquid biofuels in Finland." Biomass and Bioenergy **(forthcoming)**.

IEA Bioenergy Task 40 (2008). Development of meaningful statistics for sustainable bio-energy trade, Paris.

IEA Task 40 (2008). Development of meaningful statistics for sustainable bio-energy trade, Paris.

IPCC (2008). Scoping Paper: IPCC Special Report Renewable Energy Sources and Climate Changes Mitigation. 28th Ession of IPCC Budapest, Hungria.

Junginger, M. (2006). Country report for the Netherlands Update 2006. IEA Bioenergy Task 40. M. d. Wit. Utrecht, Copernicus Institute.

Lafargue, F. H. (2008). Standardization for solid biofuels and solid recovered fuels. Development of meaningful statistics for sustainable bio-energy trade, Paris, IEA Task 40.

Ljones, O. (2007). "Report from the Oslo group on Energy Statistics." Statistics Norway, from http://millenniumindicators.un.org/unsd/envaccounting/ceea/meetings/UNCEEA_2_Bk8.pdf.

London Group (2007). Environmental Economic Accounting. 31th Meeting, Johannesburg, South Africa.

Moreiro, J. R. (2008). Scoping meeting for special report on renewable energy sources and their role on climate change mitigation. CENBIO-IEE. Luebeck, Germany.

OGES (2008). Draft report of the third meeting Oslo Group on Energy Statistics (OGES), Vienna, Austria.

Packbier, W. (2007). Czech proposals for change to the Combined Nomenclatura (CN). To:CBS, From: Eurostat (CNC/STAT 6028 & 6244).

Penman et al, J. (2003). Good practice guidance for land use, land-use change and forestry. Hayama, Japan, Institute for Global Environmental Sciences (IGES).

Roubanis (2008). Efforts on European level to improve information on wood energy and renewable energy statistics. National wood resource balance workshop. Geneva, UNECE / FAO.

Scasny et al, M. J. K. a. T. H. (2002). "Material flow accounts, balances and derived indicators for the Czech Republic during the 1990's." Ecological Economics **2003**(45): 41-47.

Segers, R. (2006). Duurzame Energie in Nederland in 2005. C. B. v. d. S. (CBS), CBS**:** 46.

Sikkema and Junginger, R. M. (2007, update May 2008). "Pellets@las: preliminary figures for the Netherlands 2005 - 2007." www.pelletsatlas.info, from www.pelletsatlas.info.

Sjoberg, L. (2008). ISO/TC 238 Solid Biofuels. E. Energy, Swedish Standards Institute. **Reference ISO/TC 238 N 003**.

Steierer, F. (2007). Wood energy in Europe & North America: a new estimate of volumes and flows. World sustainable Energy Days 2007, Wels, Austri.

UNECE / FAO (2006). Proceedings of UNECE/FAO policy forum 5 October 2006. Public procurement policies on wood and paper products and their impacts on SFM and timber markets
Geneva, Switzerland.

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

UNECE / FAO (2008b). National wood resource balance workshop, Geneva, Switzerland.

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

UNSD. (2007). "City groups; Oslo groups on statistics; London group on environmental accounting." from http://unstats.un.org/unsd/methods/citygroup/index.htm.

UNSD. (2008a). "Global Assessment on Energy Statistics and Balances." from http://unstats.un.org/unsd/envaccounting/ceea/survey.asp.

UNSD (2008b). Preliminary report on the global assessment of energy statistics and balances. Thirty ninth session.

US Census Bureau (2007) Foreign Trade Statistics Schedule B. **Volume**, DOI:

US ITC (2007) Tariff Information Center. By Chapter, Harmonized Tariff Schedule of the US **Volume**, DOI:

Vlosky, R. P. (2008). Annual report to the FAO/UNECE Working Party on Forest Economics and Statistics. Accomplishment and future planned activities, UNECE / FAO.

Walter, A. F. R., P.B. Dolzan, E. Piacente & K. Borges da Cunha, (2007). Market evaluation: Fuel Ethanol. Deliverables 8. T. S. b.-e. trade, UNICAMP; IEA Bioenergy**:** 75 pages.

Watson et al, R. T. (2000). Land use, land-use change and forestry. Cambridge, United Kingdom+, Cambridge University Press.

WCO. (2008). "About us; profile: Amending the HS." from www.wcoomd.org/hoem_about_us.htm.