EUROPEAN PARLIAMENT

STUDY

Policy Department
Economic and Scientific Policy

INCLUSION OF SUSTAINABILITY CRITERIA IN THE FUEL QUALITY DIRECTIVE

(IP/A/ENVI/FWC/2006-172/Lot 1/C2/SC2)

IP/A/ENVI/ST/2007-3

PE 385.651

This study was requested by the European Parliament's Committee on the Environment, Public Health and Food Safety - Reference Contract IP/A/ENVI/FWC/2006-172/Lot 1/C2/SC2).

Only published in English.

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Manuscript completed in June 2007.

Executive summary

Directive 1998/70/EC relating to the quality of petrol and diesel fuels, better known as Fuel Quality Directive (FQD), is currently under revision. The revision aims to set new standards for transportation fuels in order to reduce air pollution (sulphur and poly aromatic hydrocarbons). In addition, the European Commission proposes a greenhouse gas emission reduction target. The Fuel Quality Directive will thus become also an instrument to fight climate change.

The Committee on the Environment, Public Health and Food Safety of the European Parliament ("the Environment Committee") requested a study on the inclusion of sustainability criteria in the revised Fuel Quality Directive.

The Environment Committee asked TAUW/Ecofys to shed light on three specific issues.

Issue One: Greenhouse gas emission reduction in the fuel quality directive

Article 7a of the draft-directive imposes a yearly reduction of CO_2 of 1% between 2011 and 2020 where 2011 is the base year. This base year in the future means that the emission level of the base year could still be influenced. It also penalises early action and introduces different obligations to different oil companies. Not an ideal situation. Therefore: is it possible to introduce an absolute figure for all fuel companies? The one percent yearly reductions would then be based on this absolute figure. Is a figure higher than 1% feasible for the longer term?

The 1% emission reduction is not unambiguously defined in the draft Directive. A possible interpretation is: the 1% reduction relates to the combustion emission of fossil fuels; the emission reduction relates to the well-to-wheel emission from the complete product mix (macro-requirement); and finally, the annual 1% reduction relates to the emission in the base year, resulting in a same absolute emission reduction (g CO_2eq/MJ/yr) for every year.

The current well-to-wheel[1] greenhouse gas emission of the complete product range will be different per Oil Company, since some companies have already taken action in introducing alternatives where others have not. Often, these early actions have been motivated by local legislation. It would be undesirable to have a specific base year emission figure per company which would indeed penalise early action. In view of the common internal market, a different base year emission figure per company, based on their individual achievements in a certain year, would even be illegal.

The use of one base year emission figure that would be valid for all oil companies seems to be more justified. For example the base year emission could be derived from the average EU fuel mix in a certain year.

This briefing proposes using a reference point in the recent past (e.g. 2005) as a basis for the 2011 target which could be 1% up to 5% emission reduction to start with.

It will be challenging to achieve 1% annual emission reduction over the period 2011 to 2020. Higher emission reduction will only be feasible by applying more alternative fuels with better well-to-wheel emission figures.

[1] Well-to-wheel means that all direct and indirect emissions resulting from the supply chain are taken into account. The supply chain starts at the source (e.g. field) and runs via national or international transportation steps and various conversion steps to the end-use. In a well-to-wheel analysis, also by-products from the chain are accounted for.

Application of high levels of biofuels also has physical boundaries at the feedstock production side and will increase risks for other aspects of sustainability. Before higher targets can be set, these risks must be understood and covered by legislation.

Issue Two: Inclusion of more specific sustainability criteria

The question whether to include sustainability criteria should be more specific. The Commission proposal already includes a very important sustainability criterion, which is the CO_2 content of fuel. The criteria missing concern biodiversity and nature conservation. One could also argue that social criteria to prevent competition between food and fuel should be included. Would it be possible to include criteria on nature protection for fuels in the proposal? Is it possible to add social criteria?

Biodiversity and nature conservation are very important topics, especially when biofuels are introduced in the product range of automotive fuels. However, it is very difficult to define whether a certain area is bio diverse or otherwise valuable nature. While some areas have been identified as being of particular high natural value, such as the UNESCO World heritage sites, there are as yet no globally accepted maps that indicate which areas could or could not be converted to plantations.

Other often cited risks of large scale consumption of biomass for bioenergy are that biomass production for bioenergy may compete with world food production and additionally may harm local food security where local food production is replaced by biomass production for bioenergy. This briefing tries to explain several misunderstandings regarding competition with food:

- The real competition is not for edible crops but for productive land and scarce resources needed to grow these edible crops.
- (Temporary) feedstock price increases can also offer benefits for exporting countries and rural populations selling the relevant feedstock.
- Despite an increased demand for food over the last decennia, real food prices have declined.

The risk for competition between fuel and food is decreased when higher fuel yields per hectare are realised on acreages that are less suitable for traditional agriculture.

Inclusion of sustainability criteria (besides greenhouse gas emissions) within the Fuel Quality Directive is expected to be problematic within the WTO framework.

Issue Three: Traceability

The traceability requirements on CO_2 are poorly elaborated in the Commission proposal. Which stages of fuel production, refining and transport should as a minimum be included in article 7a? And (referring to question 2): which impact on biodiversity, nature conservation or social relations should be included?

Parameters that play an essential role in calculating the greenhouse gas balance of each chain are the conversion yields for each step and the largest energy uses in each step. Some material uses also have a large impact on the total greenhouse gas performance, such as (in the case of biofuels), the use of fertilisers in the production of the feedstock. In general international transport distances play a minor role in the total greenhouse gas emissions. On the other hand local transport of feedstock with a low energy density in trucks could contribute significantly.

This briefing considers the use of default parameters in the calculation of the greenhouse gas performance as acceptable. At the same time, reporting parties should be encouraged to obtain (and prove) at least the most important parameters themselves.

Suitable feedstock sustainability criteria can be derived from existing hallmarks. These contain several generic environment related criteria and several generic social related criteria.

Contents

Chapter 1 — Introduction

1.1 Background to the revision of the Fuel Quality Directive

Directive 1998/70/EC established minimum specifications for petrol and diesel fuels for use in road and non-road mobile applications. These specifications were established for health and environmental reasons. The Commission states in its Explanatory Memorandum that the proposal for revision of the Directive *"will contribute to reducing air pollutant and greenhouse gas emissions from road and non-road fuel use and help to implement the Community strategies on air quality and on climate change. It will lead to lower emissions of particulate matter. It will also enable the use of higher volumes of biofuels while taking into consideration environmental and health requirements. It will reduce greenhouse gas emissions from the fuels regulated."*

For the Commission, *"the main reasons for reviewing the Directive stem from evolving fuel and engine technology and the growth in biofuel use. The Community air quality goals set in the Thematic Strategy on Air Pollution and the continuing need to address Greenhouse Gas emissions are the other main factors influencing the need for revision of the Directive."* The Fuel Quality Directive will thus become one of the instruments to fight climate change.

The Committee on the Environment, Public Health and Food Safety of the European Parliament ("the Environment Committee") intends to study the inclusion of sustainability criteria in the revised Fuel Quality Directive from September 2007 onwards. In preparation to this study, a workshop is to be held on July 5th 2007 with experts.

In preparation to this workshop, the Environment Committee has asked TAUW/Ecofys to respond to three specific questions:

1. Article 7a of the draft-directive imposes a yearly reduction of CO_2 of 1% between 2011 and 2020 where 2011 is the base year. This base year in the future means that the emission level of the base year could still be influenced. It also penalises early action and introduces different obligations to different oil companies. Not an ideal situation. Therefore: is it possible to introduce an absolute figure for all fuel companies? The one percent yearly reductions would then be based on this absolute figure. Is a figure higher than 1% feasible for the longer term?
2. The question whether to include sustainability criteria should be more specific. The Commission proposal already includes a very important sustainability criterion, which is the CO_2 content of fuel. The criteria missing concern biodiversity and nature conservation. One could also argue that social criteria to prevent competition between food and fuel should be included. Would it be possible to include criteria on nature protection for fuels in the proposal? Is it possible to add social criteria?
3. The traceability requirements on CO_2 are poorly elaborated in the Commission proposal. Which stages of fuel production, refining and transport should as a minimum be included in article 7a? And (referring to question 2): which impact on biodiversity, nature conservation or social relations should be included?

1.2 Developments on sustainability of transportation fuels

Driven by the rapid expansion of the biofuel industry and societal concerns about the sustainability of those biofuels, several European Member States have started to develop methodologies to measure, report and judge on the sustainability of those biofuels. Netherlands and UK are developing tools to consistently calculate the greenhouse gas emission from biofuel supply chains and have introduced obligatory reporting on the sustainability aspects of the feedstock to those biofuels. Both countries have an intensive cooperation to harmonise these systems. Germany and Switzerland are also developing greenhouse gas calculation tools.

The European Commission (DG TREN) has recently commissioned a study on certifying the sustainability of biofuel feedstocks, and intends to include minimum requirements on certain sustainability issues in the revision of Directive 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport, also known as the Biofuels Directive.

In general sustainability aspects of biofuels can be divided into two groups (see Figure 1):

- Sustainability of the feedstock, or of separate steps in the chain. This concerns social and environmental aspects often at the source of the chain. This can be limited to the plantation, but could also include the first processing steps or local conversion into intermediate or final products. Often these aspects are caught in formulations on what practice is (not) acceptable.
- Sustainability of the supply chain. This concerns the sustainability of the chain as a whole. Often these aspects can be expressed by numbers, e.g. greenhouse gas emissions, fossil energy use, net yield per hectare.

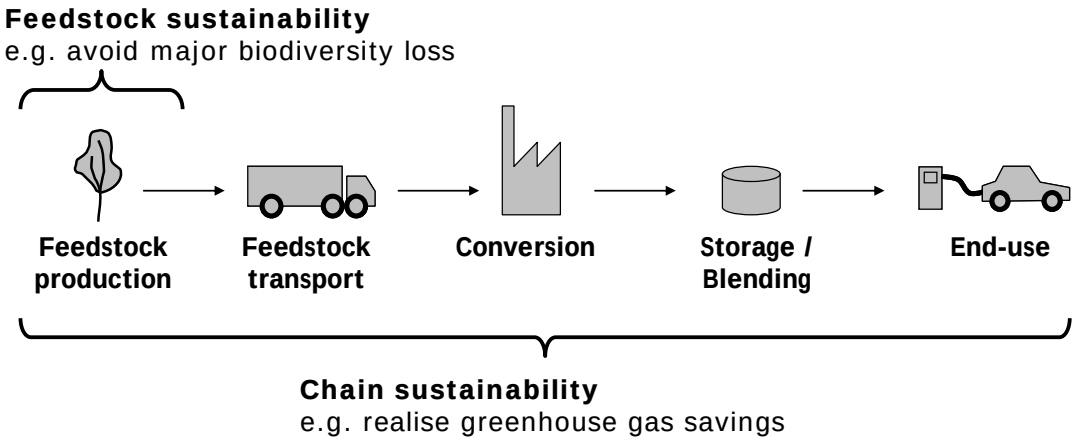

Figure 1. Sustainability of the feedstock, sustainability of the chain.

1.3 Broader scope than biofuels alone

The questions brought up by the Environment Committee concern discussions on the sustainability of biofuels, but also refer to more options such as to increase the sustainability of the transportation fuels sector, e.g. use of hydrogen, electricity.

The ongoing developments in the judgement of the sustainability of biofuels can be utilised to develop methods to judge the complete fuel mix, broader than biofuels only.

1.4 Structure of the briefing

This briefing presents insights from the authors who have a substantial experience in biofuels and sustainability. A limited amount of key literature is used to substantiate several important statements. A few additional calculations have been performed.

The briefing is structured along the three main questions presented in Section 1.1 (Chapters 2, 3, 4). Each question leads to several separate questions which are also answered. Besides, this briefing will give more background information and other related aspects relevant for the understanding of the specific issue.

Chapter 5 is dedicated to other relevant issues concerning the inclusion of sustainability aspects in the Fuel Quality Directive and other developments in Europe. The briefing ends with conclusions and recommendations in Chapter 6.

1.5 Disclaimer

This briefing presents examples of calculations for greenhouse gas emissions and fossil energy use. The presented numbers should be treated with care and can by no means be used as a direct basis for legislation.

Chapter 2 — Issue One: Greenhouse gas emission reduction in the fuel quality directive

Question 1: Article 7a of the draft-directive imposes a yearly reduction of CO_2 of 1% between 2011 and 2020 where 2011 is the base year. This base year in the future means that the emission level of the base year could still be influenced. It also penalises early action and introduces different obligations to different oil companies. Not an ideal situation. Therefore: is it possible to introduce an absolute figure for all fuel companies? The one percent yearly reductions would then be based on this absolute figure. Is a figure higher than 1% feasible for the longer term?

2.1 Greenhouse gas emissions from combustion of fossil fuels

The automotive transportation sector is responsible for a greenhouse gas[1] emission of approximately 1 Gtonne $CO_{2,eq}$ per year in Europe. The total emission per vehicle is a function of:

- The annual distance driven by the vehicle (km);
- The fuel efficiency of that vehicle (GJ/km);
- The emission resulting per unit of fuel (tonne CO_{2eq}/GJ).

The revision of the Fuel Quality Directive only concerns the last item, the emission resulting per unit of fuel. This emission basically originates from (1) combustion of the fuel during usage in the car and (2) actions to process the fuel and bring it to the end-user. The latter, indirect, emissions are generally not included in statistics on the greenhouse gas emissions from the transportation sector, since these emissions take place in other sectors of the market. However, in order to compare alternatives, it is necessary to include these indirect emissions in the discussion.

The amount of greenhouse gas emission from combustion is fixed for each type of fossil fuel as it is a direct function of the amount of carbon atoms in the fuel (Table 1). Basically, these emissions can not be avoided for these types of fuels.

Emissions in the rest of the fossil fuel supply chain mainly originate from the use of energy for exploration, international transport, refining and distribution. Therefore, these emissions mainly consist of CO_2. The resulting composition of greenhouse gas emissions from fossil fuels are shown in Figure 2.

[1] In the directive, CO_2 emission should read greenhouse gas emission. Also other greenhouse gasses should be taken into account. Especially when biofuels become part of the fuel supply, dinitrogen oxide (N_2O) emissions arising from agricultural activity, or methane (CH_4) emissions from the uncontrolled open-air digestion of residues, can become very important.

Table 1. Greenhouse gas emissions from combustion of fossil derived transportation fuels (Hamelinck 2004).

Fuel	**Greenhouse gas emission**	
	Mass basis (kg CO_2/kg fuel)	**Energy basis (g CO_2/MJ_{LHV})**
Gasoline	3.2	73.6 [1)]
Diesel	3.2	75.2 [2)]

1) Based on a Lower Heating Value of 43.5 GJ_{LHV}/tonne.

2) Based on a Lower Heating Value of 42.5 GJ_{LHV}/tonne.

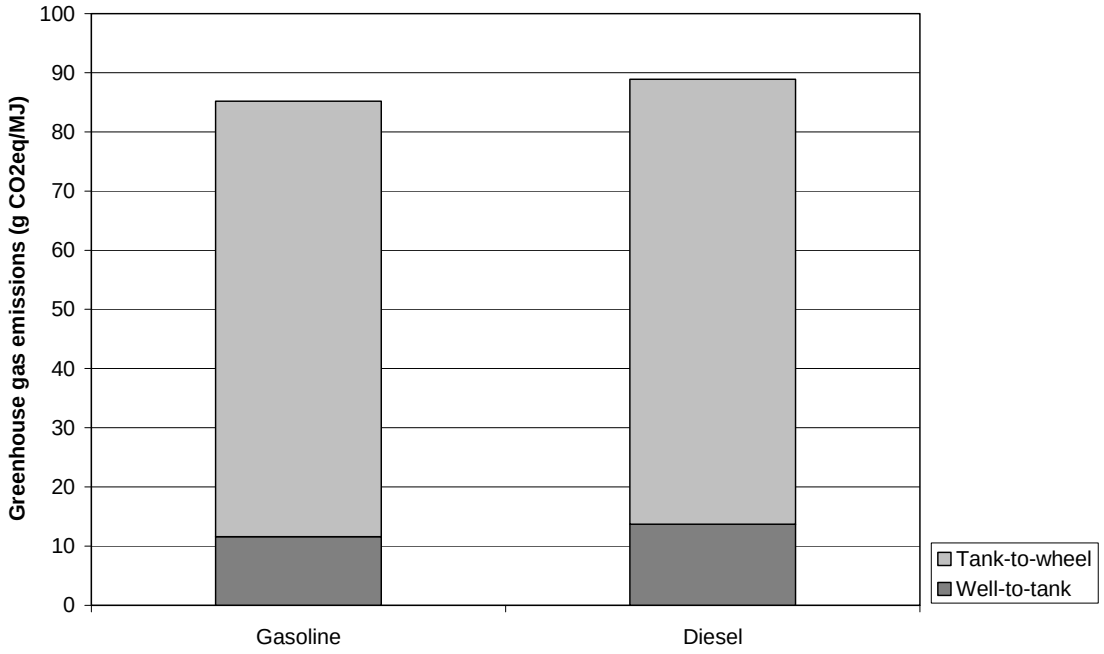

Figure 2. Well-to-tank and tank-to-wheel[2] emissions of fossil fuels.

If the fuel product mix would not change, the emissions from fuel combustion would not change and only the emissions from the supply chain can be reduced. This is further dealt with in the next subsection.

[2] Well-to-tank emissions are the emissions that take place along the supply chain up to the gas station, this includes feedstock production, all transportation and conversion steps. Tank-to-wheel emissions are the emissions that take place when combusting the fuel in the car. Together these form well-to-wheel emissions.

2.2 Greenhouse gas emissions from supply of fossil fuels

The fossil energy use and greenhouse gas emissions in the fossil fuel supply chain up to the gas station (well-to-tank) mainly consist of exploration, international transport, refining and distribution. The respective contributions are summarised in Table 2.

Table 2. Well-to-tank energy use and greenhouse gas emissions from typical fossil fuel supply chains (Edwards, et al. 2007).

	Energy use (MJ/MJ final product)	**Greenhouse gas emission (g CO_{2eq}/MJ final product)**
Crude oil production and conditioning at source	0.025	3.3
Crude oil transportation to markets	0.010	0.8
Crude oil refining to gasoline	0.08	6.5
to diesel	0.10	8.6
Gasoline and diesel fuel distribution	0.020	1.0

The total well-to-tank[3] greenhouse gas emission for gasoline and diesel is 11.6 and 13.7 g CO_{2eq}/MJ final product respectively. This is thus (refer to Figure 2) 16% and 18% of the total well-to-wheel emissions.

These well-to-tank emissions thus especially reside in exploration and refining. As more difficult oil sources are currently being taken into production, it is likely that the energy use of exploration will increase rather than decrease. In general, refineries are already very efficient. In recent years, a relative decrease in efficiency has been seen as a result of more stringent product specifications (e.g. lower sulphur content).

A few reduction options could be implemented in the fossil fuel supply chain, such as capture of carbon dioxide at the refinery and (underground) storage. This is only economically feasible for the locations in the refinery where CO_2 comes available at a reasonable concentration. The associated gas at the source used to be commonly flared but is now generally either conditioned and shipped separately (e.g. LPG) or re-injected into the reservoirs. The contribution of these options to the reduction of the greenhouse gas emissions is expected to be limited to a small part of the dark grey well-to-tank part of Figure 2.

[3] Well-to-tank emissions are the emissions that take place up to delivery of the fuel to the gas station, this includes crude oil production and conditioning at source, crude oil transportation to markets, crude oil refining to gasoline or diesel, and gasoline and diesel fuel distribution. Well-to-tank emissions do not include the emissions from combusting the fuel in the car.

It can be concluded that it is almost impossible to realise sufficient reduction of greenhouse gas emission within the present fossil fuel product mix. The emission reduction must thus be realised by changing the product mix or by introducing alternative fuels.

2.3 Strict definition of the 1% greenhouse gas emission reduction[4]

As shown, the total well-to-wheel emission of gasoline and diesel consists of well-to-tank and combustion emissions. It is therefore important to define very strictly which emission is the basis for the 1% emission reduction and which part of the supply chain is affected by the requirement.

In the context of this briefing, the 1% is considered to be 1 % of the combustion emission of these fossil fuels in absolute numbers, since that number will be easier to agree upon than on the well-to-tank or well-to-wheel emission. Furthermore, the base year emission is considered to be the complete well-to-wheel emission from the product mix.

With these definitions, the absolute annual emission reduction should be for gasoline 0.736 g CO_{2eq}/MJ_{LHV} and for diesel 0.752 g CO_{2eq}/MJ_{LHV} (1% of the emissions in Table 1). The reference emission is found by adding well-to-tank emissions (e.g. refer to Table 2) to well-to-wheel emissions, for a certain base year. The proposed emission target over the years 2011 – 2020 is thus regularly and constantly decreasing for both gasoline and diesel.

2.4 Specific base year emission figures per oil company; penalising early action

From the fact that the different fuel products have different well-to-wheel greenhouse gas emissions and that the emission reduction has to be realised by changing the product mix or by introducing alternative fuels, it can be concluded that the greenhouse gas emission per company must be calculated over its complete product range, a so-called macro-requirement.

Inclusion of this macro-requirement on greenhouse gas emissions in the Fuel Quality Directive is not obvious; this is further discussed in Section 5.2.

The current well-to-wheel greenhouse gas emission of the complete product range will be different per oil company, since some companies have already taken action in introducing alternatives where others have not. Often, these early actions have been motivated by local legislation.

It would be undesirable to have a specific base year emission figure per company which would indeed penalise early action. In view of the common internal market, a different base year emission figure per company, based on their individual achievements in a certain year, would even be illegal.

2.5 One base year emission figure for all oil companies

The use of one base year emission figure that would be valid for all oil companies seems to be much more justified. For example the base year emission could be derived from the average EU fuel mix in a certain year.

[4] The draft proposal mentions CO_2 reduction. This should read CO_2 emission reduction (or greenhouse gas emission reduction); it is the emission that has to be reduced, rather than the molecules (which would be a chemical reaction).

However, that would imply that fuel companies that have a higher fraction of gasoline in their product range[5] would have a comparative advantage over those who supply relatively more diesel (as gasoline well-to-wheel emissions are lower than diesel emissions, see Table 1 and Table 2). This could still be an undesirable effect, especially if we note that diesel is generally used at higher efficiencies in diesel engines than gasoline is used in spark ignition engines.

A solution could reside in using an emission target per oil company calculated from the composition of the product range (with a focus on where those products are applied). However, this would add too much complexity, especially where some fuels can be applied in multiple automotive subsectors.

The difference in application efficiency is preferably not to be accounted for in the Fuel Quality Directive, but dealt with in other policy measures (e.g. excise tax exemption).

2.6 Base year in the future, or base year in the past

A base year in the future, even if it is derived in a generic way, will demotivate companies to take action now. If this would be the option of choice, the future reference point must not be taken further than three years from now. A better option would be to take a reference point in the recent past (e.g. 2005) and use this as the basis for the first target for 2011. The 2010 target could be a 1% up to 5% emission reduction relative to the 2005 reference point.

2.7 Emission reduction through new fuels in the fuel product mix

In Section 2.2 it was already concluded that it is almost impossible to realise sufficient reduction of greenhouse gas emission within the present fossil fuel product mix. The emission reduction must thus be realised by changing the product mix or by introducing alternative fuels. The different options for alternative fuels are:

- ***Biofuels***
  With the targets of the current Biofuels Directive and the revision of that Directive, there could be a growth of the contribution of biofuels to the total transport fuels market from 5.75% to 20% between 2010 and 2020. If the average greenhouse gas performance of these biofuels is 50% better than their fossil alternatives, the greenhouse gas emission reduction realised is approximately 7% for the complete automotive fuels sector. However, without appropriate national or European measures most biofuels may not even achieve a 50% emission reduction. Thus, with the present projections, the ambitions set in the amendment to the Fuel Quality Directive will not be met. Either higher fractions of biofuels or improvements in the general greenhouse gas performance of biofuels are required.

- ***Hydrogen***
  Hydrogen is the preferred fuel for fuel cell vehicles. Hydrogen can be produced from many sources, such as from natural gas or via electrolysis from electricity. It can even be a biofuel (via gasification and steam reforming). The source of the hydrogen is important in judging its well-to-wheel greenhouse gas performance. When using green electricity (via electrolysis) the emission reduction potential is large, even at low conversion efficiencies. When using natural gas (via reforming) the effect will be limited.

[5] The product range of a refinery is determined by the crude oil selection, which is based partly on the initial refinery design and partly on the cost of the different available crudes.

- ***Electricity***
  Electricity as an automotive fuel will generally not be delivered by the traditional oil companies, but rather from power companies. Only where oil companies are directly involved in the sales of electricity to cars (e.g. fast charging at gas stations), it could be argued that this should account for in the oil company's greenhouse gas target. The origin of the electricity will determine its greenhouse gas performance.

2.8 Emission reduction higher than 1% on the longer term

Based on the explanations in Sections 2.2 and 2.7 it becomes clear that it will be challenging to achieve 1% annual emission reduction over the period 2011 to 2020. Higher emission reduction will only be feasible by applying more alternative fuels with better well-to-wheel emission figures. Application of high levels of biofuels also has physical boundaries at the feedstock production side and will increase risks for other aspects of sustainability. Before higher targets can be set, these risks must be understood and covered by legislation.

2.9 Need for a consistent greenhouse gas calculation methodology

Many studies deal with the greenhouse gas balance of one or more biofuel supply chains. They all yield different results because:

- The calculation method is different;
- The data underlying the processes are different.

Since the differences can be very large it is impossible to draw conclusions for single supply chains as actually found in the market from existing studies. Therefore, each specific supply chain has to be evaluated separately using a consistent and broadly accepted methodology.

Both UK and the Netherlands are developing calculation tools[6] to assess individual supply chains in a more consistent manner. On the one hand, this requires that the methodology is defined much more precise and leaves little space for free interpretation. On the other hand, it is necessary to include as much insights into the individual chains as possible.

The well-to-wheel greenhouse gas emission of a specific fuel depends on the complete supply chain, including all processes and co-products. Scientists have broadly agreed on the methodology to calculate these emissions. However a few methodological issues still remain under discussion, most notably:

- Dealing with co-products, either by allocation or system expansion;
- The effect of land use and land use change on the soil carbon balance and how to account for this in the total greenhouse gas balance;
- Indirect displacement effects resulting from the extra demand put on the market.

[6] E4Tech develops a carbon calculation methodology for biofuels in the UK, commissioned by the LowCVP. Ecofys and CE develop a greenhouse gas calculator for biofuels in the Netherlands, commissioned by SenterNovem. Both tools are to be used for reporting the greenhouse gas performance of biofuels under the obligation schemes in these countries.

Methods of data collection have implications for the level of detail in the calculation, but also for the insights in the entire chain from an end-user's perspective. Information collection is further dealt with in Chapter 4. The uncertainties[7] in this type of calculations will have consequences for their acceptance within the oil industry if the outcomes have a significant impact on the economic value of the (bio)fuel.

[7] Uncertainties in the results are caused by uncertainties in chain specific input parameters, by uncertainties in generic parameters, and unknown uncertainties in the method. The oil companies that will be reporting can fill in their own chain specific parameters provided they can substantiate those parameters with e.g. legal prove.

Chapter 3 — Issue Two: Inclusion of more specific sustainability criteria

Question 2: The question whether to include sustainability criteria should be more specific. The Commission proposal already includes a very important sustainability criterion, which is the CO_2 content of fuel. The criteria missing concern biodiversity and nature conservation. One could also argue that social criteria to prevent competition between food and fuel should be included. Would it be possible to include criteria on nature protection for fuels in the proposal? Is it possible to add social criteria?

3.1 Biodiversity and nature conservation

Biodiversity and nature conservation are very important topics, especially when biofuels are introduced in the product range of automotive fuels. Although these issues are difficult to measure and judge, several methodologies have been developed within hallmarks organisations. These methodologies and organisations are feedstock specific, with examples like wood being dealt with by the FSC[8] and palm oil by the RSPO[9].

In the framework of their biofuels policy, the Netherlands and UK have further defined the judgement of these issues in the form of criteria and indicators. Existing hallmarks function as the basis, on top of which additional checks may be necessary.

It is very difficult to define whether a certain area is biodiverse or otherwise valuable nature. While some areas have been identified as being of particular high natural value, such as the UNESCO World heritage sites[10], there are as yet no globally accepted maps that indicate which areas could or could not be converted to plantations. More explanation to the certification of biodiversity is given in Section 4.2 and examples of criteria and indicators for biodiversity are given in Table 3.

It would be valuable to have a list of "no-go areas" agreed upon by the most relevant environmental protection organisations. These should also include areas that may not be very valuable in itself but play an important role in connecting other valuable nature areas.

3.2 Competition between food and fuel

Other often cited risks of large scale consumption of biomass for bioenergy are that biomass production for bioenergy may compete with world food production and additionally may harm local food security where local food production is replaced by biomass production for bioenergy.

There are several issues relating to competition with food sector which need to be further explored, because they are often misunderstood. It is often stated that using edible crops for bioenergy forms a higher threat to food security than using inedible crops. However, this argument is flawed as the real competition is not for edible crops but for productive land (and water and other scarce resources) needed to grow these edible crops.

[8] FCS: Forest Stewardship Council.
[9] RSPO: Roundtable on Sustainable Palm Oil.
[10] whc.unesco.org

The goal should be to optimise biofuel production per hectare and to minimise the use of already existing agricultural land. For example, the production of palm oil (a food crop with a high yield per hectare) on waste land does not compete with food.

A second simplification is that the use of biomass, especially edible crops, increases food prices and thereby hurts the poor. Reality is more complicated. Indeed, a sudden rise in the demand for certain commodities for bioenergy may lead to (temporary) price increases of that commodity as well as of other commodities (If US farmers collectively switch their soy production to the production of maize for ethanol production, this may lead to a, temporary, increase in soy prices). However, such (temporary) price increases have both winners and losers among the poor. Net exporting countries of the relevant commodities can actually benefit from the higher prices while net importing countries will suffer. This means that even if food availability declines on a global scale, food access may improve for the rural poor (UN 2007).

Furthermore, neo-Malthusian scenarios of food shortages and dramatic price increases find little evidence in history. While demand for food has risen dramatically in the last decennia with increasing world population and per capita food consumption, real agricultural prices have declined 56% in the last 46 years (World Bank 2007).

The risk for competition between fuel and food is decreased when higher fuel yields per hectare are realised on acreages that are less suitable for traditional agriculture.

3.3 Displacement

Competition with food is often regarded in isolation from displacement effects. However, these two macro effects actually have great similarities in the mechanisms that drive them as well as the solutions that prevent them. The main cause of sudden rises in food prices is the replacement of existing food production by production of energy crops. The energy crop may be the same as the food crop which it replaces (e.g. an existing palm oil plantation supplying the energy market in stead of the food market) or may be a different crop (e.g. US soy producers switching from soy cultivation to energy maize cultivation). The risk of a reduction in local food production and thereby local food security in poor regions is also caused by a replacement of existing food production by energy crop production. In other words, the displacement mechanisms are at the heart of the risk of rising food prices and reduced local food security.

The solution offered to prevent unwanted displacement effects will also greatly reduce the risk of sudden rises in food prices and the risk of a reduction in local food security. Displacement effects could be compensated by matching the additional demand from the energy sector by an additional food supply (in a new, sustainable plantation) or restoration of degraded land to forest.[11]

3.4 Requirements to sustainability vis-à-vis WTO agreements

WTO agreements were made to eliminate protectionism in which products from the own country are favoured over imported products from third countries. Because of WTO agreements, it is in general not possible to distinct between “like products” that have a physical or chemical composition and have the same function or application.

[11] For example, the estimated displacement risk is X hectares of plantation needed elsewhere, or Y hectares of tropical forest that are destroyed elsewhere. If such acreage is realized within a project, net displacement effects are avoided.

It is, in general, not possible to distinct between products on basis of their non-product related characteristics such as the source of origin or the manner in which they were produced.

There are, however, exceptions to this general rule, mentioned in a finite list in the GATT. This concerns amongst others the possibility to distinct on basis of the global environmental effect of the product or the way it was produced. This means that it should in principle be possible to exclude some products from the European market because of their contribution to the greenhouse gas effect.

Local environmental and social effects are clearly *not* mentioned in this *finite* list and therefore they can not be used as a basis for exclusion. These effects are limited by the territorial boundaries and because of the sovereignty of third countries we cannot interfere.

Even where WTO offers the opportunity to exclude products on basis of their contribution to the greenhouse gas effect, it is advisable to discuss with the affected countries or industries to find solutions other than complete exclusion.

Acceptance within WTO will be difficult when de facto products from EU Member States are treated differently from products from outside the EU.

Acceptance within WTO is more likely when the exclusion is limited to incentive schemes and less likely when the exclusion concerns the complete market. For example it will be more likely accepted when excluded products are only excluded from a subsidy scheme, or do not count towards an obligation, but can nevertheless be sold on the rest of the market. Inclusion of sustainability criteria within the Fuel Quality Directive would mean that some products would be excluded completely from the EU market. Therefore this measure is less likely to be accepted within the WTO framework.

3.5 Reporting obligation rather than sustainability requirement

As it can be concluded from Section 3.4, it will be very difficult or even impossible to include requirements on the sustainability of the feedstock in the Fuel Quality Directive because of WTO restrictions.

Other solutions have been sought in UK and the Netherlands. Companies that sell biofuels on the markets of these countries (within the frame of e.g. the biofuels obligation) will be obliged to report on several sustainability aspects of those biofuels. The reports will be published (e.g. on the internet) and it is expected that NGOs and the general public will be able to influence the obliged parties to optimise the sustainability of their biofuels.

The companies will also be allowed to report that the feedstock of their biofuel was produced in an unsustainable way, or that they simply “don’t know”. This will not have consequences for the accounting within the biofuel obligation, but it is expected that the public opinion will limit the utilisation of that biofuel in such situations.

Chapter 4 — Issue Three: Traceability

Question 3: The traceability requirements on CO_2 are poorly elaborated in the Commission proposal. Which stages of fuel production, refining and transport should as a minimum be included in article 7a? And (referring to question 2): which impact on biodiversity, nature conservation or social relations should be included?

4.1 How to measure greenhouse gas emission reduction

To be able to calculate the greenhouse gas balance of a biofuel supply chain, data is required about every single step along the chain. Parameters that play an essential role in calculating the greenhouse gas balance of each chain are the conversion yields for each step and the largest energy uses in each step. Some material uses also have a large impact on the total greenhouse gas performance, such as (in the case of biofuels), the use of fertilisers in the production of the feedstock. In general international transport distances play a minor role in the total greenhouse gas emissions (few percent of the total well-to-wheel greenhouse gas emissions), because of the large scale of the transportation actions and the high energy density of the transported material. On the other hand local transport of feedstock with a low energy density in trucks could contribute significantly.

The principle of data collection seems very straightforward, but there is one major complication, namely that at many stages in the chain, mass flows with different environmental performance are blended or split. These effects generally prohibit an organised information flow through the supply chain.

There are, however, two solutions to bring information about the supply chain to the end-user:

- Chain-of-custody;
- Continuous carbon labelling.

A chain-of-custody[12] approach (not further explained in this briefing), eventually yields average data for each typical step in the biofuel supply chain which can than be submitted and used in the calculation of the greenhouse gas balance of the entire chain (see Figure 3).

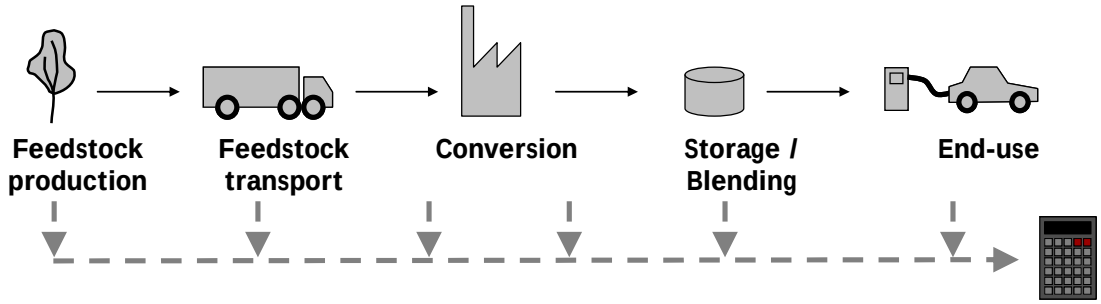

Figure 3. Calculation afterwards on basis of collected data.

[12] In a chain-of-custody approach, all actors in the supply chain are verified by an accredited company to ensure that all relevant information from every step is available at the end of the chain.

The option of continuous carbon labelling throughout the supply chain is practiced in UK approach to greenhouse gas emission reporting for the RTFO[13].

In this option information on the carbon intensity flows through the chain. Each actor in the biofuel supply chain will request from his supplying parties that they calculate the carbon intensity using a unified methodology (see Figure 4). Both options will have their advantages and disadvantages.

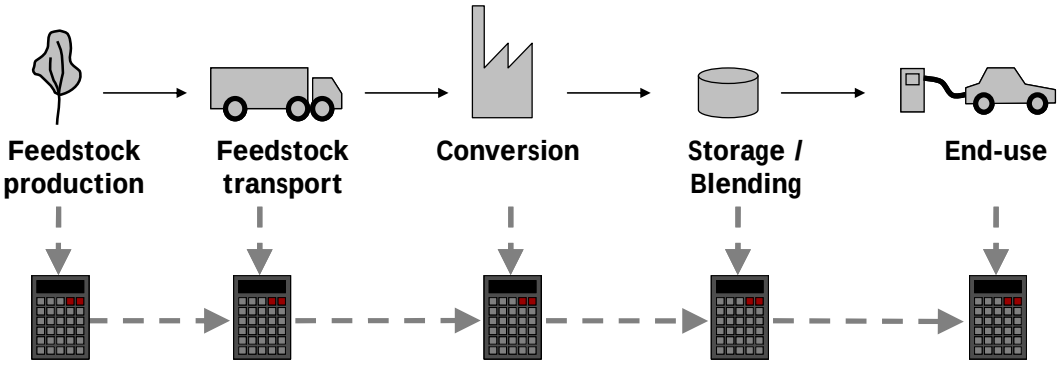

Figure 4. Continuous calculation of the carbon intensity along the chain.

Since the traceability of the information further upstream towards the source may be difficult or problematic, it could be acceptable to use default parameters in the calculation of the greenhouse gas performance. In the Dutch and UK approach, these default parameters are chosen either typical (average) or conservative (worst practice) depending on the relevance of the parameter in the final result and on the expected ease of obtaining the real parameter. In this way, reporting parties are encouraged to obtain (and prove) at least the most important parameters.

4.2 Environmental and social criteria

As was concluded in Chapter 3, it will be very difficult or even impossible to include requirements on the sustainability of the feedstock in the Fuel Quality Directive because of WTO restrictions. Independent of the eventual conclusion in that respect, a list of the most stressing issues with regard to biodiversity, nature conservation and social relations can be established.

Defining a set of principles and criteria for an international Meta-Standard[14] for sustainable biomass should be the result of a process with relevant stakeholder involvement. It is therefore not the aim of this briefing to prescribe a definite set of principles and criteria. It is promising though to see that many of the existing initiatives for sustainable biomass production are based on similar principles.

[13] RTFO: Renewable Transport Fuel Obligation.

[14] The Meta-Standard approach builds upon existing standards for sustainable agriculture and forestry. Compliance with the Meta-Standard is achieved through certification against an existing standard which gives (sufficient) coverage of the sustainability criteria in the Meta-Standard.

Environmental principles in general include:

- Biomass production will not destroy or damage large above or below ground carbon stocks;
- Biomass production will not lead to the destruction or damage of high biodiversity areas (split out in Table 3);
- Biomass production does not lead to soil degradation;
- Biomass production does not lead to the contamination or depletion of water sources;
- Biomass production does not lead to air pollution.

For biodiversity conservation, within the reporting schemes being developed in the Netherlands and UK, the concept of High Conservation Values (HCV) is used (see Table 3). Because it is recognized that these HCV's have not yet been determined for many areas, the areas considered of importance for the conservation of biodiversity have been specified further by referring to specific areas as defined by authorities such as the IUCN, UNESCO and RAMSAR.

As with the environmental principles, the social principles proposed in this briefing are largely based on the work in the Netherlands and UK:

- Biomass production does not adversely affect workers rights and working relationships;
- Biomass production does not adversely affect existing land rights and community relations.

These principles[15] could be a valuable input for defining international sustainability criteria.

[15] The criteria under these principles have largely been based on the work of SASA (Social Accountability in Sustainable Agriculture). Members of SASA include: Social Accountability International (SAI), Fairtrade Labelling Organizations International (FLO), International Federation of Organic Agriculture Movements (IFOAM), and Sustainable Agriculture Network (SAN). SASA focuses only on labour conditions and not on land right issues. Therefore, additional criteria were added to deal with land right issues and the effects of the feedstock production unit on the local community. ISEAL (International Social and Environmental Accreditation and Labelling) Alliance is the organization which runs the SASA program. ISEAL clearly stated that criteria for land right issues should indeed make part of any standard for sustainable biofuel feedstock production.

Table 3. Example of possible environmental criteria and indicators for Principle 2: Biodiversity conservation - Biomass production will not lead to the destruction or damage of high biodiversity areas.

Criterion	Indicators
2.1 Compliance with national laws and regulations relevant to biomass production and the area where biomass production takes place.	• Evidence of compliance with national and local laws and regulations with respect to: o Land ownership and land use rights o Forest and plantation management o Protected and gazetted areas o Nature and wild life conservation o Land use planning o National rules resulting from the adoption of CBD[16] and CITES[17]. • The company should prove that: o It is familiar with relevant national and local legislation o It complies with these legislations It remains informed on changes in legislation
2.2 No conversion of high biodiversity areas after November 30, 2005[1)]	• Evidence that production does not take place in gazetted areas. • Evidence that production does not take place in areas with one or more HCV areas[18]: o HCV 1, 2, 3 relating to important ecosystems and species o HCV 4, relating to important ecosystem services, especially in vulnerable areas o HCV 5, 6, relating to community livelihoods and cultural values. Evidence that production does not take place in any areas of high biodiversity as listed below this table.
2.3 The status of rare, threatened or endangered species and high conservation value habitats, if any, that exist in the production site or that could be affected by it, shall be identified and their conservation taken into account in management plans and operations.	• Documentation of the status of rare, threatened or endangered species and high conservation value habitats in and around the production site. • Documented and implemented management plan on how to avoid damage to or disturbance of the above mentioned species and habitats.
2.4 Preservation and/or improvement of biodiversity on production sites	• Evidence that a minimum of 10% of the production area is set aside and properly managed for nature conservation and ecological corridors. • Evidence of good agricultural practices with respect to the conservation and improvement of biodiversity on and around the production site.

1) The reference date for land use change is set at November 2005 in UK and at June 2007 in The Netherlands. The recent reference date was chosen in order to stimulate biomass production on degraded lands, even if these have been created recently. Excluding degraded lands which have been created relatively recently would diminish the chances for sustainable biofuel production on degraded land. In addition, November 2005 is consistent with the reference date of the most recent initiative for sustainable energy crop production which has defined criteria for land use change, the Roundtable on Sustainable Palm Oil.

* The "carbon pay back time" is defined as the number of years a biofuel feedstock crop needs to grow before the destruction of the carbon storage resulting from land use change has been compensated. This can be calculated by: (carbon stock destruction expressed in resulting tonne C/ha) / (annual C abatement as a result of biofuel production which is a function of crop yield and GHG-reduction of the biofuel chain.) By taking the difference in average carbon stocks of the original vegetation and the energy crop, perennial energy crops are stimulated because they have a higher average carbon stock.

[16] http://www.biodiv.org/com/convention/convention.shtml

[17] http://www.cites.org/eng/disc/text.shtml

[18] The definition of the 6 High Conservation Values can be found at http://www.hcvnetwork.org.
Currently no comprehensive maps exist which define HCV areas. For many areas it will therefore still be necessary to assess whether HCV's are present or not. The following initiatives are helpful in defining areas with one or more HCV's: Conservation International - Biodiversity Hotspots; Birdlife international - Important Bird Areas; The WWF G200 Ecoregions: the regions classified 'vulnerable' or 'critical/endangered'; European High Nature Value Farmland.

Chapter 5 — Other issues

5.1 Fuel quality directive in relation to other EU directives

Addressing sustainability in the Fuel Quality Directive can be complementary to sustainability requirements set by other EU directives (such as the revised Biofuels Directive) or by individual Member States. Policy makers responsible for one option could learn from developments in the other options. Since sustainability of feedstock and chain is a relatively new subject in legislation, part of the methodology is still under development and it may be wise to allow different approaches in parallel to find the best.

At the same time, it should be avoided that approaching the fuel sustainability from too many sides leads to a maze of opaque legislation which would only discourage the introduction of new alternative fuels, regardless of their environmental performance. It is advised to perform a full assessment on the relations between the Fuel Quality Directive and policies in the member states.

5.2 Macro requirement on greenhouse gas emission reduction

The Fuel Quality Directive normally sets physical and chemical requirements for each batch of a certain fuel. Sustainability criteria on the other hand, can rarely be directly related to the physical product. It is impossible to prove the sustainability of the feedstock per batch, or the well-to-wheel greenhouse gas performance.

Sustainability criteria will rather be applied as a macro requirement to the entire product range of an oil company. It is not clear if the Fuel Quality Directive is suitable for such macro requirements.

Chapter 6 — Conclusions and recommendations

6.1 Issue One: Greenhouse gas emission reduction in the fuel quality directive

- The 1% emission reduction is ill-defined in the draft Directive. In the context of this briefing, the 1% is considered to mean 1% of the combustion emission from gasoline or diesel. The emission reduction holds for the complete well-to-wheel supply chain and the 2010 reference emission also concerns the complete well-to-wheel emissions.
- The current well-to-wheel greenhouse gas emission of the complete product range will be different per oil company, since some companies have already taken action in introducing alternatives where others haven't. Often, these early actions have been motivated by local legislation. It would be undesirable to have a specific base year emission figure per company which would indeed penalise early action. In view of the common internal market, a different base year emission figure per company, based on their individual achievements in a certain year, would even be illegal.
- TAUW has proposed to use a reference point in the recent past (e.g. 2005) as a basis for the 2011 target which could be 1% up to 5% emission reduction to start with.
- It will be challenging to achieve 1% annual emission reduction over the period 2011 to 2020. It is almost impossible to realise sufficient reduction of greenhouse gas emission within the present fossil fuel product mix, the emission reduction must thus be realised changing the product mix or by introduction alternative fuels.
- Higher emission reduction will only be feasible by applying more alternative fuels with better well-to-wheel emission figures. Application of high levels of biofuels also has physical boundaries at the feedstock production side and will increase risks for other aspects of sustainability. Before higher targets can be set, these risks must be understood and covered by legislation.

6.2 Issue Two: Inclusion of more specific sustainability criteria

- Biodiversity and nature conservation are very important topics, especially when biofuels are introduced in the product range of automotive fuels. It is very difficult to define whether a certain area is biodiverse or otherwise valuable nature. Except for nationally protected nature areas and UNESCO World heritage sites, there are as yet no globally accepted maps that indicate which areas could or could not be converted to plantations. It would be valuable to have a list of no go areas" agreed upon by the most relevant environmental protection organisations. These should also include areas that may not be very valuable in itself but play an important role in connecting other valuable nature areas.
- Other often cited risks of large scale consumption of biomass for bioenergy are that biomass production for bioenergy may compete with world food production and additionally may harm local food security where local food production is replaced by biomass production for bioenergy.

This briefing tries to explain several misunderstandings regarding competition with food:

  - The real competition is not for edible crops but for productive land and scarce resources needed to grow these edible crops.
  - (Temporary) feedstock price increases can also offer benefits for exporting countries.
  - Despite an increased demand for food over the last decennia, real food prices have declined.

- The risk for competition between fuel and food is decreased when higher fuel yields per hectare are realised on acreages that are less suitable for traditional agriculture.
- Inclusion of broader sustainability criteria (outside greenhouse gas emission) within the Fuel Quality Directive would probably not be accepted within the WTO framework.

6.3 Issue Three: Traceability

- Parameters that play an essential role in calculating the greenhouse gas balance of each chain are the conversion yields for each step and the largest energy uses in each step. Some material uses also have a large impact on the total greenhouse gas performance, such as (in the case of biofuels), the use of fertilisers in the production of the feedstock. In general international transport distances play a minor role in the total greenhouse gas emissions. On the other hand local transport of feedstock with a low energy density in trucks could contribute significantly.
- This briefing considers the use of default parameters in the calculation of the greenhouse gas performance as acceptable. Reporting parties should be encouraged to obtain (and prove) at least the most important parameters themselves.
- Suitable feedstock sustainability criteria can be derived from existing hallmarks. These contain several generic environment related criteria and several generic social related criteria.

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