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REPORT FROM THE COMMISSION

on indirect land-use change related to biofuels and bioliquids

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1. INTRODUCTION

1.1. Background

Renewable energy, including biofuels, is an essential element of the EU´s energy and climate strategy. Biofuels are important because they help tackle two of the most fundamental challenges in energy policy with regards to transport: the overwhelming dependency of the transport sector for oil and the need to decarbonise transport.

Supporting biofuels offers other opportunities too. They can contribute to employment in rural areas, both in the EU and in developing countries and they offer scope for technological development, for example in second-generation biofuels.

In 2009, through Directive 2009/28/EC on the promotion of the use of energy from renewable sources (the "Renewable Energy Directive"), the EU adopted mandatory targets to achieve by 2020 a:

– 20% overall share of renewable energy

– 10% share for renewable energy in the transport sector

These mandatory targets are to provide certainty for investors and to encourage continuous development of technologies which generate energy from all types of renewable sources.

At the same time, through Directive 2009/30/EC ("the Fuel Quality Directive") the EU adopted a mandatory target to achieve by 2020 a:

– 6% reduction in the greenhouse gas intensity of fuels used in transport

The aim of this target is to secure specific reductions in greenhouse gas emission associated with all aspects of production and use of energy used for road transport and non-road mobile machinery.

The contribution towards these targets from biofuels is expected to be significant[1]. Therefore, it is important that biofuel production is sustainable. In order to avoid negative side-effects both Directives (hereafter referred to as "the Directives") include the most comprehensive and advanced sustainability scheme anywhere in the world. They impose a number of sustainability criteria that economic operators need to meet in order for biofuels to be counted towards the legislative targets and qualify for support schemes[2]. These criteria aim at preventing the conversion of areas of high carbon stock and high biodiversity for the production of raw materials for biofuels. Moreover, they also require biofuels to achieve minimum greenhouse gas emission savings of 35% compared to fossil fuels. This requirement is progressive as it increases to 50% in 2017 and 60% in 2018 for new installations.

[1] The recently submitted National Renewable Energy Action Plans estimate that biofuels will represent around 9% of the total energy consumption in transport in 2020.

[2] The sustainability criteria also apply to 'bioliquids' used for electricity or heating and cooling.

The sustainability criteria[3] may have an impact in commodity markets broader than biofuels, potentially enhancing sustainable production of agricultural raw materials as a side-effect. However, due to growing global demand for agricultural commodities there is a risk that part of the demand for biofuels will be met through an increase in the amount of land devoted to agriculture worldwide.

Therefore, the Directives require the Commission to report to the European Parliament and to the Council by 31 December 2010, reviewing the impact of indirect land-use change on greenhouse gas emissions and addressing ways to minimise that impact[4]. The report should, if appropriate, be accompanied by a proposal, based on the best available scientific evidence, containing a concrete methodology for emissions from carbon stock changes caused by indirect land-use change[5].

Although land-use change can have a wide range of positive and negative impacts (i.e. greenhouse gas emissions, biodiversity, social issues, etc), this report focuses on the consequences for the greenhouse gas emissions of biofuels, as required by the Directives. The Commission will analyse wider sustainability impacts associated with the promotion of biofuels in the Renewable Energy Directive's biennial reports to the European Parliament and the Council from 2012 onwards. Moreover, the Commission believes that it is important to tackle indirect land-use change for biofuels through a holistic approach considering, comparatively, the life-cycle sustainability of fuels used in the transport sector. This will also be considered in the forthcoming impact assessment.

1.2. What is indirect land-use change?

The use of fossil fuels and land-use change are the main contributors to anthropogenic greenhouse gas emissions. The use of biofuels may reduce greenhouse gas emissions provided that direct and indirect greenhouse gas emissions are lower than those from fossil fuels they replace.

In the next decades it is foreseen that a higher world population and standards of living will lead to increasing demand for food, feed, energy and fibre from the earth's ecosystems. These increased demands are likely to lead to an increased need for agricultural commodities globally. This increase can come from yield increases and expansion of agricultural land. The increased use of biofuels in the EU adds to this existing demand for agricultural commodities.

Biofuel feedstock may be produced on land directly converted from another status to agricultural land. The carbon emissions from such land-use change have to be included in the overall calculation of greenhouse gas emissions of the specific biofuel, in order to determine if it meets the sustainability criteria[6]. However, if it is instead cultivated on existing agricultural land, it may then displace other crop production some of which ultimately may lead to conversion of land into agricultural land. Through this route, the extra biofuel demand can lead *indirectly* to land-use change, from which the term indirect land-use change is derived. This indirect effect manifests itself through a change in demand for agricultural commodities, and their substitutes, in global markets. The change of price may give

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[3] The Commission adopted in June 2010, two Communications aimed at facilitating the implementation of the sustainability criteria included in the Directives including through recognition of voluntary schemes.

[4] The requirement in the Renewable Energy Directive also applies to bioliquids. As such, references to biofuels in this report will also apply to bioliquids where appropriate.

[5] Article 7d(6) of Directive 2009/30/EC and Article 19(6) of Directive 2009/28/EC

[6] There are also restrictions related to specific no-go areas, see Article 17 of Directive 2009/28/EC and Article 7b of Directive 2009/30/EC.

incentives to change behaviour, leading to the increased use of land, which in many cases implies land-use change. The increased price can also change behaviour by incentivising increased yields on existing agricultural land.

The basic driver for indirect land-use change is the increased demand for agricultural crops in a situation where both suitable agricultural land availability and potential yield increases are limited. Some other key factors, such as achieving maximum profit from the production and complying with related legislation in place, are also likely to play a role in determining how the increased demand is to be realised.

The extent to which land availability is limited in various regions of the world is much debated. Figure 1 below[7] depicts the harvested area in different regions of the world. Compared to 1981 the harvested land has significantly declined in Europe, CIS and North America, thus suggesting that there would be low carbon stock land available[8].

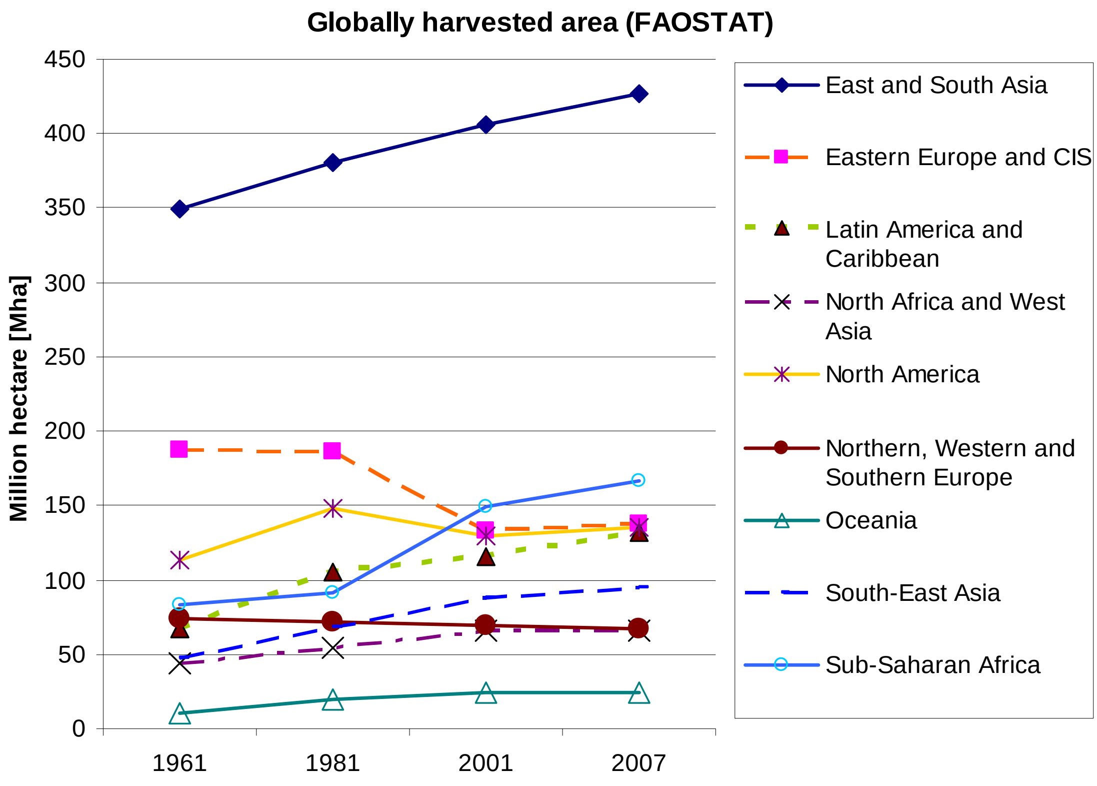

Figure 1: Globally harvested area from 1961 to 2007

The limited availability of low-carbon stock land in other parts of the world and the lack of more stringent protection of forests and carbon rich areas are factors that can contribute to damaging indirect land-use change. If conversion of carbon rich areas were to be limited or if more agriculture commodities were subject to sustainability criteria comparable to those laid down for biofuels, indirect land-use change could be limited. The reason for this is that the

7 FAO Statistics. Note that there is an important difference between "harvested area" and "cultivated area". Double-cropping in a field would double the amount of harvested area, while cultivated area remains constant.

8 However, if it is the least fertile land that has been recently abandoned, then its future production could be expected to show typical yields below average, leading to either increased land requirements or increased use of fertilisers. In addition, if the land is under a process of afforestation, its reversion to agricultural production could result in the release of carbon emissions,.

indirect land-use change effect of biofuels is the *direct* land-use change of another commodity.

2. ESTIMATING GREENHOUSE GAS EMISSIONS DUE TO INDIRECT LAND-USE CHANGE

Estimating the greenhouse gas impact due to indirect land-use change requires projecting impacts into the future, which is inherently uncertain, since future developments will not necessarily follow trends of the past. Moreover, the estimated land-use change can never be validated, as indirect land-use change is a phenomenon that is impossible to directly observe or measure. Therefore modelling is necessary to estimate indirect land-use change[9]. In order to base its work on the best available scientific evidence, the Commission launched a number of analytical exercises and a review of existing literature on the subject of indirect land-use change during 2009 and 2010[10]. In addition, the Commission conducted various consultation exercises with the wider community, including a pre-consultation on the possible policy approaches[11], and one further exercise once final versions of the studies were made available[12]. In recognising the difficulties associated with the numerous uncertainties in these modelling studies, leading global technical experts were involved in exploring the outputs and conclusions from the analytical work.

The analytical work carried out was based on several studies, namely

– Impacts of the EU biofuel target on agricultural markets and land-use: a comparative modelling assessment by the Institute for Prospective Technological Studies of the EC's Joint Research Centre. (IPTS)

– Global trade and environmental impact study of the EU biofuels mandate by the International Food Policy Research Institute (IFPRI)

– The impact of land-use change on greenhouse gas emissions from biofuels and bioliquids, an in-house review conducted for DG Energy (Literature review).

– Indirect land-use change from increased biofuels demand – comparison of models and results for marginal biofuels production from different feedstocks by the Institute for Environment and Sustainability of the EC's Joint Research Centre (JRC).

In addition, a range of other external reports or articles deemed relevant, of which most have their origin in the debate on indirect land-use change in the US, have been considered, including the most recent report[13] done by the JRC (Joint Research Centre). The nature of the work was wide-ranging, covering several aspects including economic modelling of the impacts of EU biofuel demand on global commodity markets and their likely response; a comparison of the main economic models used at a global level to understand indirect land-use change including the facilitation of dialogue between the various modelling teams; a novel approach to determine the likely location of land that would be converted to agricultural use as a result of increased demand, and a literature review.

Two of these reports involved separate modelling exercises. The first, carried out by IPTS, used the AGLINK-COSIMO model. This modelling assumed that the 10% renewable energy in transport target would be met using 7% conventional biofuels and 1.5% advanced biofuels that would be double counted. Although this model considered the impacts from the additional demand of conventional biofuels needed to meet the target, it did not consider any

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9 The models do not distinguish between *indirect* and *direct* land-use change

10 http://ec.europa.eu/energy/renewables/studies/land_use_change_en.htm

11 http://ec.europa.eu/energy/renewables/consultations/2009_07_31_iluc_pre_consultation_en.htm

12 http://ec.europa.eu/energy/renewables/consultations/2010_10_31_iluc_and_biofuels_en.htm

13 "*Biofuels a new methodology to estimate GHG emissions from global land-use change*", http://re.jrc.ec.europa.eu/bf-tp/download/EU_report_24483_Final.pdf

impacts resulting from additional demand for either advanced biofuels or bioliquids. The bioethanol-biodiesel shares considered were identical to the shares of petrol and diesel, i.e. approximately 35% and 65%, so that the share of biofuel in petrol and diesel were each respectively approximately 8.5%. The final conclusion of the modelling was that the additional demand resulting from the policy compared to a counterfactual 2020 scenario[14], equalled to 21 Mtoe, which would result in an increase of the total land area required for crops of 5.2 million hectares globally, one quarter of which is in the EU. This modelling did not provide a calculation of the greenhouse gas impacts of this land conversion.

The second modelling exercise was carried out using the MIRAGE model by the International Food Policy Research Institute (IFPRI). This modelling was based on the assumption that the 10% renewable energy in transport target would be met using 5.6% conventional biofuels with the remainder met in other ways, including a contribution of 1.5% from advanced biofuels, under current trade policy and assuming full trade liberalisation. Additional demand for advanced biofuels and bioliquids was not modelled. The conclusion of the modelling was that the additional demand resulting from the policy compared to a counterfactual 2020 scenario[15], equalled to 8 Mtoe, which would result in an increase of total land area required for crops of 0.8 and 1 million hectares globally, under the business as usual and free trade scenarios, respectively. Converted into greenhouse gas emissions this compares to 18 grams[16] of $CO_{2\text{-eq.}}$ per MJ of energy (subsequently written as g/MJ). The bioethanol-biodiesel shares were set as 45% and 55% respectively. The overall land requirements increased to 2.8 million hectares globally in the scenario using 8.6% conventional biofuels, resulting into average emissions of 30g/MJ.

The split between bioethanol and biodiesel turned out to be of great importance for the (indirect) land-use change impact estimated using the IFPRI MIRAGE model. In a further IFPRI MIRAGE model run using the 5.6% scenario, and a 25% bioethanol/75% biodiesel split gave average (indirect) land-use change emissions of around 45 g/MJ[17]. These results are summarized in the table below.

Split between bioethanol and biodiesel (%)	45/55	35/65	25/75
Average land-use change emissions (g/MJ)	18	31	45

Table 1: Results of sensitivity analysis of various bioethanol/biodiesel splits on the average (indirect) land-use change emissions-

The crop-specific greenhouse emissions resulting from each additional MJ of biofuel were also calculated and are outlined in figure 2[18].

14 The baseline of the counterfactual scenario assumes very low levels of biofuel penetration as main policy incentives are removed.

15 The baseline of the counterfactual scenario assumes 2008 biofuel penetration levels are maintained.

16 The emissions from land-use change are distributed over 20 years.

17 See slide 34 of the presentation given by David Laborde of IFPRI at the 2nd consultation meeting (26 October 2010) available at http://ec.europa.eu/energy/renewables/consultations/doc/public_consultation_iluc/global_trade_environmental_impact_study_eu_biofuels_mandate.pdf

18 The marginal values are computed by adding 0.1% of the total EU consumption of biofuels to the consumption in 2020 for one crop at a time. The marginal increase gives unexpected results due to the high dependence on specific marginal effects in the agro-economic zone of the last marginal unit of biofuel. This effect results for sugar beet ethanol in estimated land-use change impact to change from 16 g/MJ to 65 g/MJ as a result of moving from a business as usual scenario to a free trade scenario without tariffs on bioethanol imports. The reason is that when sugar beet is used to produce bioethanol,

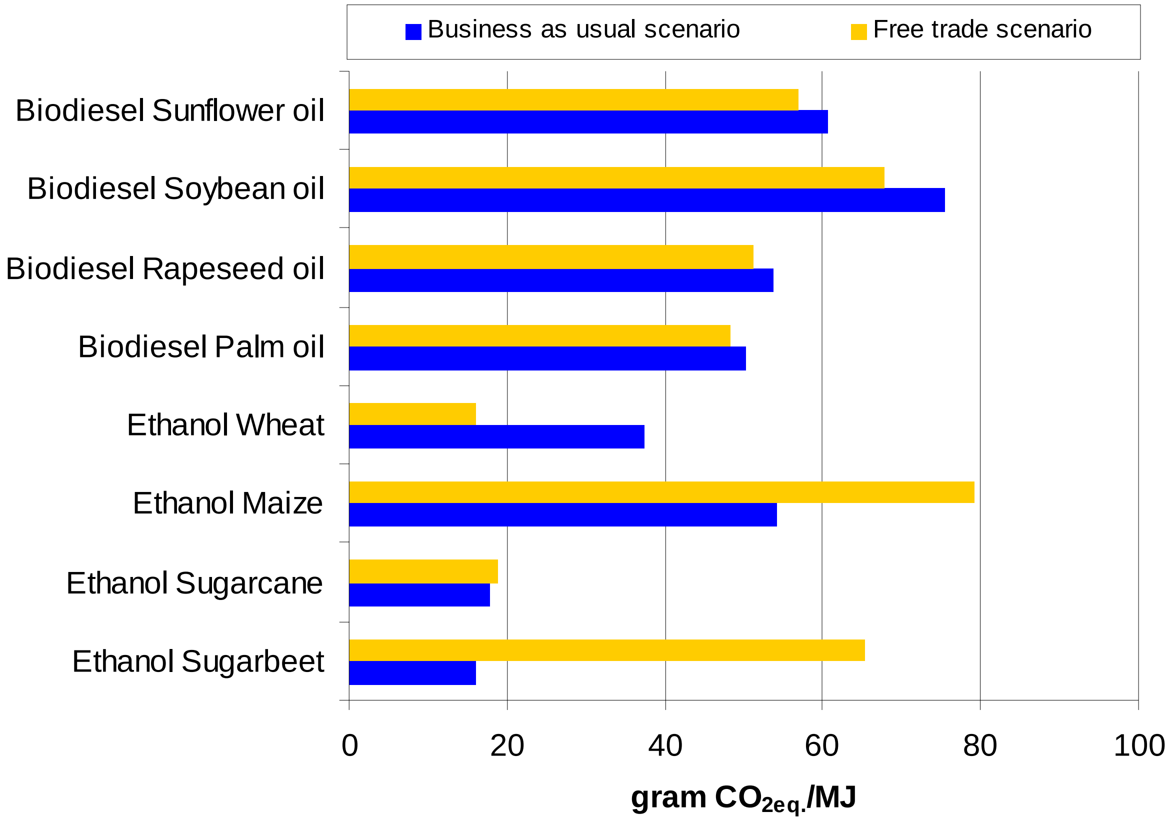

Figure 2: (Indirect) land-use change emissions for different feedstocks, and trade scenarios (IFPRI 2010)

As can be seen, model results thus vary considerably across feedstocks and trade assumptions[19].

In view of the fact that the AGLINK-COSIMO model does not have a land conversion module, it was agreed to develop a methodology for allocating land areas converted and calculating the resulting greenhouse gas emissions. This Spatial Allocation Methodology (SAM) was developed by the Joint Research Centre based upon a number of GIS databases. Within the model, the decision on where to convert new land is based upon land suitability and distance to existing cultivated areas. It has so far only been used with the land requirements resulting from the AGLINK-COSIMO and IFPRI MIRAGE modelling. For these data sets the SAM calculates that greenhouse gas emissions would amount to 1092 Mt CO_{2eq} and 201Mt CO_{2eq} respectively, which translates into average (indirect) land-use change emissions of 64 g/MJ for AGLINK-COSIMO, and 34-41 g/MJ for the IFPRI MIRAGE central scenario. The SAM can be used with land area inputs from any model, thus helping to remove one of the causes of variation in GHG emissions between different models[20].

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additional imports of sugar (not sugar beet) occur from land (in Africa and South East Asia) with very high carbon content.

19 Additional model scenarios runs of the IFPRI-MIRAGE are being conducted, as to ensure the latest demand estimates to 2020 from the Member States are captured. In addition, further sensitivity analysis aimed at providing a better characterisation of the probability distribution associated with the crop specific ILUC emission values is also being conducted.

20 The Joint Research Centre will extend the application of their Spatial Allocation Methodology (SAM) beyond the central IFPRI MIRAGE scenario (5.6%) to higher demand scenarios. The possibility of using this methodology to calculate crop-specific greenhouse gas emission values will also be explored.

For specific feedstocks, various modelling exercises give different results for the same crop. The literature mostly contains figures for US-relevant biofuel feedstocks, i.e. mainly maize and to some extent soya. The table below summarizes the main results found for these two feedstocks:

Land-use change in g/MJ[21]	**Maize ethanol**	**Soya biodiesel**
Searchinger et.al. (2008)	156	165-270
CARB (2009)	45	63
EPA (2010)	47	54
Hertel et.al. (2010)	40	-
Tyner et.al (2010)	21	-
IFPRI MIRAGE (2010)	54	75

Table 2: Summary of feedstock specific land-use change emission values (Literature review)

The results outlined above are the result of different models working under different assumptions. As can be seen from the table, the results vary considerably, thus showing the deficiencies and uncertainties in modelling (indirect) land-use change, with the values for maize bioethanol ranging between 21 and 156 g/MJ.

The geographical origin of the feedstock could also be a significant variable in estimating the (indirect) land-use change impact of a specific biofuel. However, none of the modelling done so far has explored this variability, which may in fact not be possible with today's models.

In the model comparison exercise managed by the Commission's Joint Research Centre, contact was made with the main modelling teams who had been carrying out modelling of (indirect) land-use change. Two expert meetings were held to agree how to carry out the comparison, to discuss findings and to understand the scope for further improving the underlying data. The (indirect) land-use change estimated by the models was in the range of 223 to 743 kha per Mtoe of ethanol used in the EU and in the range of 242 to 1928 kha per Mtoe of biodiesel used in the EU. In comparison AGLINK-COSIMO scenarios (run by the OECD for the model comparison exercise) for Brazilian sugar cane and US ethanol are respectively 134 and 574 kha per Mtoe; IFPRI MIRAGE scenarios were estimated to be around 100 kha per Mtoe. The work explored the reasons for the variations in land area required. The main factors influencing the outputs were found to be the fraction of crop saved by by-products, reductions in food and feed consumption[22], increases in yields and effects of crop displacements. Moreover, the modelling comparison study found that current models do not capture a number of factors, which if taken into account, would increase the estimated

21 Results have been adjusted to a 20 years timeframe.

22 The economic models compared estimate that part of the feedstock for biofuels comes from reduced food and feed consumption and this can significantly reduce (indirect) land-use change emissions.

land-use change impact. These factors include emissions from the conversion of peat-lands[23]. Moreover, apart from (indirect) land-use change emissions as discussed in this report, models do not consider at least two additional sources of increased emissions: the emissions from yield intensification due to crop price rises, and the extra emissions from growing crops on marginal land rather than on existing cropland.

The Literature review, among other things discussed various deficiencies and uncertainties associated with the modelling, most of which is based on economic principles, where decision making on e.g. land-use change, is reduced to a least-cost optimization problem. However, it is known that in reality several non-economic factors influence what land-use change takes place and where it occurs. Some of these drivers are related to political choices (land-use and agricultural policy, land rights, etc.), others to institutional features (proximity to infrastructure and markets, land-use legislation). Therefore conceptual limitations will always remain. While prices affect decisions about what to plant, other factors than price are drivers for which land was cleared for cropping[24].

Notwithstanding these conceptual limitations, it can be argued that the best available methodology to estimate (indirect) land-use change is still through economic models where decisions are made based on relative prices[25]. However, within this framework of economic modelling, there will always be a range of unsolved issues, which influence the results considerably. The modelling is dependent on assumptions, most importantly related to the treatment of co-products[26], existing yields[27], marginal yields[28], food and feed consumption[29], classification of land[30], elasticities[31], carbon stock values[32], type of land converted[33], modelling of pasture[34] and the drivers of deforestation[35]. Our understanding of these has evolved in the recent years, but a number of deficiencies and uncertainties remain.

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23 Models do not properly take into account the emissions from peat oxidation following drainage process required in the cultivation of palm oil, which could underestimate real emissions by an order of magnitude.

24 Even with substantial additional investments in data and analysis there seem to be limits to the degree to which quantitative estimates of the role of any one factor influencing land-use change can be improved.

25 One alternative approach has emerged recently, which rather uses a "causal-descriptive" methodology, where the main critical inputs are expert/stakeholder based, together with historical and statistical data (E4tech 2010)

26 Most biofuel feedstocks co-produce considerable quantities of co-products. Most models do now take this into account, although at various ratios, greatly influencing model results. Co-products normally replace animal feed, freeing up land that would otherwise be needed for its production.

27 Yields increases are normally assumed to continue at historic rates whereas such predictions are uncertain.

28 There is little empirical evidence on developments of marginal yields.

29 Economic models assume demand being a function of price, with different assumptions as to how the additional demand for biofuels will impact on food and feed commodity markets.

30 Land availability and land classification is an essential input for land-use change modelling, however, figures and terminology are not consistent across datasets.

31 Elasticities are often estimated on basis of data from developed countries, while models suggest that indirect land-use change typically takes place in developing countries.

32 Carbon stock values attributed to different vegetations and soils vary considerably across studies, and play an essential part in determining the indirect land-use change impact.

33 The type of land that is converted to cropland has a major influence, as carbon stocks vary considerably across land types. Due to too course spatial resolution regional differences risk getting lost in the geographical aggregations.

34 Pasture for animals covers large parts of the globe, and offer potential supply of land for cultivation. However, how pasture is modelled and its interlinkages with feed markets and cropland differs between models. The assumptions has major impacts on the overall results, as pasture is covering a large fraction of the terrestrial surface, and has relatively low carbon stocks.

In addition, the Literature review found that current models are incapable of capturing a number of factors, including the conversion of forest on peat-land which can lead to considerable carbon emissions. However, the majority of such factors would, if captured, reduce the estimated land-use change impact. These include- the allocation of all emissions to crop expansion, whereas deforestation may be driven simultaneously by crop expansion and logging; rate of yield improvements in response to increased demand for biofuels[36]; structural changes[37]; and; the protein content of various feeds and co-products, which is rarely fully reflected[38]. In addition, the effects of the binding sustainability criteria for biofuels in the Directives (which the models take as having no impact) have not been taken into account. Finally, the literature review notes that in order to compare the greenhouse gas impacts of the policy, it is important that the sum of direct emissions from biofuels and the unknown indirect land-use change emissions are compared to the fossil fuels not being extracted as a consequence of using biofuels.

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35 Drivers behind deforestation are complex, where local authorities, land-use rights and political economy all play a role. It is not possible to properly reflect this real world effects in the models, where decision making is reduced to a purely rational economic question.

36 Increased yields are a function of a complex set of variables, among them increased investment and research, both of which take place as a response to the biofuel policy. It is however difficult to capture this effect in the models.

37 Structural changes are typically difficult to predict by models as elasticities are based on historical data. Considerable increase in use of land in e.g. CIS is therefore unlikely according to the models, while such a structural change could take place both in the baseline and in the policy scenario.

38 This is thus underestimating the land saved by co-products. For example, in the EU soy meal is a key source of protein, of which around 97% is imported. There is thus considerable scope of substitution.

3. DEVELOPMENTS IN INTERNATIONAL REGULATORY ACTIONS TO ADDRESS (INDIRECT) LAND-USE CHANGE

In the United States, biofuel use is promoted at Federal level with different targets for different types of biofuels A minimum greenhouse gas savings of 20% applies and it is higher (50%, 60%) for second generation biofuels. Greenhouse gas savings have been established for different types of biofuels through consequential lifecycle assessment in order to determine whether they meet the relevant threshold (a type of biofuel either meets the threshold or it does not; economic operators do not have an alternative of showing evidence for any actual emissions). This analysis includes emissions from (indirect) land-use change decided through modelling, distinguishing between national and international land-use change. Grandfathering until 2022 applies for existing installations.

In the United States at the State level, California has implemented a Low Carbon Fuel Standard[39]. Lifecycle greenhouse gas emissions for all fuels within the scope of the legislation need to be known for the legislation to function. Greenhouse gas emission factors have been developed for the various fuel pathways including (indirect) land-use change emissions.

A number of countries have put in place land-use policies to prevent land expansion into land with high carbon stock. One example is Brazil, the biofuels producer with the most historical experience, which has put in place agro-ecological zoning for sugarcane in order manage land expansion for energy crops and, at the same time, improve the conditions for protection of sensitive areas. It is currently complementing this with zoning for economic activities in the Amazon region, according to environmental criteria. Argentina, the main exporter of biofuels to EU, has a moratorium in law on any cutting of natural forest until every Argentine province has produced an inventory and land management plan as well as an obligation to produce an environmental impact study before approving any clearing of the forests. Argentine provinces have begun enacting land zoning policies, laying out areas where agricultural expansion is banned due to environmental concerns and areas where agricultural expansion is permissible. Norway and Indonesia have signed a detailed letter of intent on cooperation on reducing greenhouse gas emissions from deforestation and forest degradation in which Norway would provide funding to enhance Indonesia's capacity on this, including a suspension on all new concessions for conversion of peat and natural forest.

Further, the Global Bioenergy Partnership[40], to which the Commission and seven EU Member States are a Partner as well as Argentina, Brazil, the US and other biofuel producing countries, is working to develop a set of relevant, practical, science-based, voluntary criteria and indicators regarding the sustainability of bioenergy. The criteria and indicators are intended to guide any analysis undertaken of bioenergy at the domestic level with a view to informing decision making and facilitating the sustainable development of bioenergy in a manner consistent with multilateral trade obligations. The Partnership has made progress on this, though the issue of indirect land-use change is one of the issues for further discussion.

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39 http://www.arb.ca.gov/fuels/lcfs/lcfs.htm
40 http://www.globalbioenergy.org/

4. SUMMARY OF THE CONSULTATION RESPONSES

As a first step for addressing indirect land-use change, the Commission carried out a pre-consultation in July 2009 on eight potential policy approaches in response to indirect land-use change.

A total of 71 responses were received.[41] Most industry, farmers' associations and overseas countries supported either no action or dealing with indirect land-use change through wider policy action, either through international action on protection of high carbon stock land and/or extending sustainability criteria to all agricultural commodities. Most NGOs and an industrial stakeholder from the non-biofuel sector, supported the inclusion of the indirect land-use change emissions within the existing greenhouse gas emission calculation for biofuels. Member States were divided on this issue.

Following the publication of the relevant analytical work in July 2010, the Commission launched a second public consultation exercise. This sought views on whether this analytical work provided a good basis for determining the significance of indirect land-use change; whether action was required, and if so what course of action would be appropriate. It also set out a number of short-listed potential policy approaches.

A total of 145 responses were received[42]. The majority of respondents were divided into two groups. Most respondents from industry, farmers' associations and overseas countries considered that the analytical work did not provide a good basis for determining the significance of indirect land-use change. They considered that no further action specific to biofuel policy should be taken, although many supported action on international agreements towards the protection of land with high carbon stock. On the other hand, most NGOs and a few industrial stakeholders from non-biofuel sectors considered that further action was needed and supported the inclusion of the indirect land-use change emissions within the existing greenhouse gas emission calculation. A number of other respondents recognised that action may be needed, favouring a variety of other measures. Member States were divided on this.

Following this public consultation, the JRC organised in November on behalf of the Commission an expert consultation, grouping world-recognised academics and experts in the field. This consultation aimed at discussing the main uncertainties related to estimations of indirect land use change [43].

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41 All responses are available at http://ec.europa.eu/energy/renewables/consultations/2009_07_31_iluc_pre_consultation_en.htm

42 All responses are available at http://ec.europa.eu/energy/renewables/consultations/2010_10_31_iluc_and_biofuels_en.htm

43 All contributions are available via http://re.jrc.ec.europa.eu/bf-tp/

5. PRELIMINARY CONCLUSIONS AND NEXT STEPS

Renewable energy, including biofuels, is an essential element of the EU´s energy and climate strategy. In this context the stable and predictable investment climate created by the Renewable Energy Directive, which already contains strict sustainability criteria for biofuels and bioliquids, including on their green house gas performance, needs to be preserved, as well as respect for the Fuel Quality Directive’s ambitious reduction target in the greenhouse gas intensity of fuels used in transport.

As far as indirect land-use change is concerned, based on the work carried out to date, the Commission believes it is possible to draw a number of conclusions. The Commission recognises that a number of deficiencies and uncertainties associated with the modelling, which is required to estimate the impacts, remain to be addressed, which could significantly impact on the results of the analytical work carried out to date. Therefore, the Commission will continue to conduct work in this area in order to ensure that policy decisions are based on the best available science and to meet its future reporting obligations on this matter.

However, the Commission acknowledges that indirect land-use change can have an impact on greenhouse gas emissions savings associated with biofuels, which could reduce their contribution to the policy goals, under certain circumstances in the absence of intervention. As such, the Commission considers that, if action is required, indirect land-use change should be addressed under a precautionary approach.

The Commission is currently finalising its impact assessment, which would focus on the assessment of the following policy options:

(1) take no action for the time being, while continuing to monitor,

(2) increase the minimum greenhouse gas saving threshold for biofuels,

(3) introduce additional sustainability requirements on certain categories of biofuels,

(4) attribute a quantity of greenhouse gas emissions to biofuels reflecting the estimated indirect land-use impact.

The Commission will present the Impact Assessment, if appropriate together with a legislative proposal for amending the Renewable Energy Directive and the Fuel Quality Directive as necessary no later than by July 2011.