Fuelling the flames

Biodiesel tested: How Europe's biofuels policy threatens the climate

Summary

Countries around Europe are steadily increasing the share of biofuels in transport fuel to meet EU renewable energy targets. At the same time, there is ongoing debate around the sustainability of certain biofuels, due to impacts on land-use change caused by their expansion.

A European Commission study to be published shortly is expected to reveal that greenhouse gas emissions associated with biofuels made from oilseed crops such as rapeseed, soy and palm oil, in particular, may exceed emissions from fossil fuels. This is because of emissions resulting from 'indirect land use change': the conversion of land-types that store carbon, such as forests, grasslands and peatlands, into farmland to grow crops for food, feed and fibres that have been displaced by fuel crops.

Meanwhile, plans drawn up by EU member states indicate that they intend to meet the renewable energy target in the transport sector for 2020 largely through the increased use of biodiesel – diesel fuel derived from vegetable or animal sources.

Already, much of the diesel sold at filling stations around Europe incorporates biodiesel. In May and June, Greenpeace bought diesel samples at filling stations in nine EU countries, and sent them for laboratory testing to identify the source of the biodiesel element. Most of the biodiesel, according to the analysis, was derived from the very crops associated with high greenhouse gas emissions due to indirect land use change: rapeseed, soy and palm oil.

It appears that, despite its attempts to reduce greenhouse gas emissions, the EU is actually promoting the adoption of the most climate-damaging biofuels, undermining its own policies.

As the European Commission prepares to review the evidence related the sustainability of biofuels, Greenpeace argues that biofuels that offer little or no reduction in greenhouse gas emissions compared to fossil fuels should not count towards renewable energy targets or qualify for incentives. We urge the EU to introduce legislation requiring energy suppliers to reflect the climate impact of indirect land-use change in the calculation of a biofuel's carbon footprint. Only correct accounting for greenhouse gas emissions of biofuels, including those associated with indirect land use change, would allow the necessary distinction between biofuels that reduce emissions and those that do not.

Increased use of biodiesel by 2020

On 23 April 2009, the European Union adopted the Renewable Energy Directive (EU-RED) which included a target to increase the proportion of renewable energy in EU transport to 10% by 2020. The EU-RED gives the EU countries the opportunity to choose their own policy measures but all countries were required to submit a National Renewable Energy Action Plan (NREAP) which should also include information on how they would achieve this target.

A recent study of the 27 NREAPs by the Institute for European Environmental Policy (IEEP)[2] reveals that European governments plan to deliver their renewable energy target for transport largely by increasing the use of 'conventional' biofuels. These are fuels derived from agricultural sources, such as oilseeds, palm oil, sugar cane and beet, wheat, soy etc.

The same study analysed that the use of conventional biofuels is predicted to rise 170% by 2020 compared to 2008, reaching 27.3 Mtoe – million tonnes of oil equivalent – to meet 8.8% of the total energy demand in transport by 2020.

1 Directive 2009/28/EC.

2 Institute for European Environmental Policy (IEEP). March 2011. 'Anticipated Indirect Land Use Change Associated with Expanded Use of Biofuels in the EU – An Analysis of Member State Performance'. Author: Catherine Bowyer. Report commissioned by ActionAid, BirdLife International, ClientEarth, European Environmental Bureau, FERN, Friends of the Earth Europe, Greenpeace, Transport & Environment, Wetlands International.

Biodiesel – for use in diesel engines – will account for 71% of the total, compared to 29% for bioethanol – for use in gasoline engines. Six member states (Germany, France, the UK, Spain, Italy and Poland) would account for 70% of the additional biofuel demand between 2008 and 2020. The table below details the increase in each EU country of conventional biofuels use by 2020 compared to 2008 (i.e. after the adoption of the EU-RED) [3]:

The EU-RED is thus expected to stimulate a major increase in the use of biofuels by 2020, with biodiesel by far the preferred option for delivering renewable energy in the transport sector.

Country	Increase in Bioethanol Usage, 2008 to 2020 (Ktoe)	Increase in Biodiesel Usage, 2008 to 2020 (Ktoe)
United Kingdom	1640	1764
Spain	255	2380
Germany	396	1963
Italy	442	972
Poland	287	895
France	160	916
Belgium	79	484
Greece	414	136
Czech Republic	66	396
Ireland	121	304
Netherlands	143	252
Sweden	250	123
**Romania	140	228
Portugal	27	313
Hungary	257	62
Finland	26	280
Bulgaria	42	150
Luxembourg	22	150
Slovenia	17	154
*Denmark	-5	130
Lithuania	20	85
Austria	25	79
Estonia	37	48
Slovakia	43	22
Latvia	0	11
Malta	6	3
*Cyprus	0	-14
Total	4910	12286

* Cyprus and Denmark show negative figures as they anticipate making use of a high proportion of advanced biofuels by 2020. Given that it is not possible to take account of the impacts of these fuels at present these negative figures were excluded from further analysis.
** It should be noted that in its NREAP Romania did not report the split between different biofuel uses in 2020; in order to enable further calculations the total figure for Romanian biofuel usage was differentiated between bioethanol and biodiesel sources based on the average split across all other Member States.

Greenpeace tests biodiesel in nine countries

Greenpeace took 92 biodiesel samples in nine EU countries[4] between 10 May and 4 June 2011. Seven of the countries where samples were taken have a mandatory blending target; one, Denmark, will make 7% blending of biodiesel mandatory in July 2011; Sweden has no target.

According to the IEEP study, the projected share of biodiesel in the increase in conventional biofuel use by 2020 for these nine countries is shown below. For example, in Germany 83% of the increase of biofuel use between 2008 and 2020 will be due to the increased use of biodiesel:

Denmark	100%
Luxembourg	87%
Belgium	86%
Fance	85%
Germany	83%
Austria	76%
Italy	69%
Netherlands	64%
Sweden	33%

At each petrol station tested one 200 ml diesel sample was filled into a PE bottle and sent to ASG Analytik in Germany, a laboratory specialised in biodiesel analysis. The laboratory first analysed the amount of biodiesel in the sample. It then studied the composition of biodiesel using the pattern of fatty acid to assign percentages of rapeseed, soy, palm, animal fat or waste oil.

The map on page 4 indicates the locations and brand of the petrol stations where fuel samples were obtained in each of the nine countries. It shows the average portion of biodiesel in all samples for each country and for all nine countries surveyed. Finally, the map shows the biodiesel composition for each of the 92 samples and the average per country.

The percentage of biodiesel in the diesel samples was between 5.5 and 7% in most of the samples. Austrian samples had the highest portion of biodiesel, Denmark the lowest. (No analysis of the composition of the biodiesel was undertaken for the Danish samples as none contained more than 0.1% of biodiesel).[5]

3 The approach was to assume a basis of Jan 2008 for pre-RED demand for bioethanol and biodiesel. It further assumed that Jan 2008 usage is 100% conventional biofuels. The increase in the table is the projected Member States usage as depicted in the NREAP of bioethanol/biodiesel minus the 2008 levels.
4 Austria, Belgium, Denmark, France, Germany, Italy, Luxembourg, Netherlands and Sweden.
5 This was also the case for 2 samples from Belgium, 1 from Germany, 2 from Luxembourg and 4 from the Netherlands.

As shown in the table below, in Austria all diesel samples contained more than 6.5% of biodiesel, in France the lowest percentage was 5% and in Germany 12 of the 15 samples had more than 6.2% of biodiesel. None of the diesel samples contained more than 7.1% of biodiesel. In the other countries the percentage of biodiesel showed more variety.

	No of samples	Average % of biodiesel, all samples	Range of biodiesel between samples*
Austria	10	6.7	6.6 - 7.0
Belgium	10	2.7	2.3 - 5.2
Denmark	10	*all samples: <0.1*	
France	11	6.1	5.6 - 6.5
Germany	15	5.5	1.0 - 6.7
Italy	10	5.8	2.4 - 7.1
Luxembourg	6	2.3	2.0 - 5.0
Netherlands	10	3.4	1.8 - 6.5
Sweden	10	5.6	4.9 - 7.1
**Samples with % <1.0 are not taken into account*			

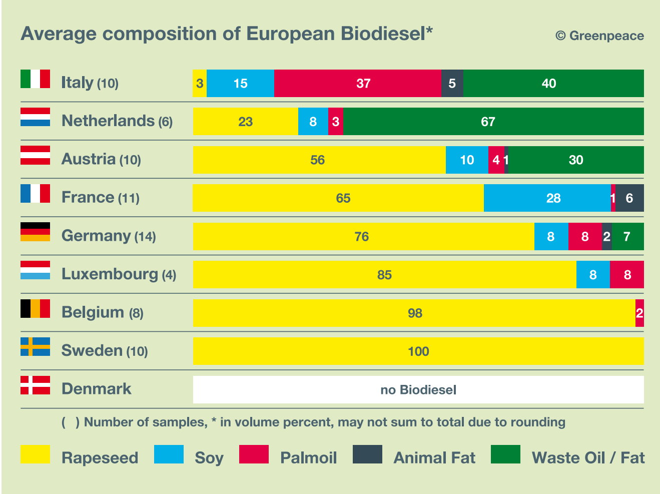
The samples were taken from a range of large national and international brands.

Brand	No of samples
SHELL	18
ESSO	14
TOTAL	13
BP, Aral	9
TEXACO	4
Q8, OKQ8	6
STATOIL	5
OMV	4
OTHERS*	19

* OK, Preem, Jet, Uno-X, Avanti, Lukoil, Agip, Intermarché, Leclerc, Carrefour and IP.

Results: what goes into our biodiesel?

Our analysis of the samples showed that the composition of the biodiesel varied between the nine member states tested. Rapeseed was by far the main source for the biodiesel, except in the Netherlands and Italy. Soy was found in six out of nine countries' samples, with France blending the highest percentage of soy: 28%. Palm oil was found in seven out of nine countries' samples, with Italy blending the highest percentage of palm oil: 37%. Samples in the Netherlands, Austria and Italy show a high percentage of waste oil, a non-conventional biofuel derived from waste products such as cooking oil.[6]



Analysis of biodiesel composition per brand suggests that brands have no apparent policy regarding the composition of the biodiesel. For example, Shell Germany uses mostly rapeseed, Shell Italy has mostly palm oil.

Impacts of biofuels on land-use change

The Renewable Energy Directive in the EU (EU-RED; see page 1) already imposes sustainability criteria for biofuels used in the EU. These criteria require minimum greenhouse gas emission savings from biofuels compared to fossil fuels (35% in 2009, rising to 50% in 2017). They also include provisions to prevent the conversion of areas of high biodiversity and carbon sinks such as forest and wetlands into land to grow fuel crops. But this rule applies only to direct land use changes.

Indirect land use change (ILUC) is not covered, even though according to the European Commission's Joint Research Centre (JRC), "it can potentially release enough greenhouse gas to negate the savings from conventional EU biofuels".[7]

6 In the Netherlands this is probably caused by the so-called double-counting of waste oil. This is a measure in the EU-RED that says that the quantity of waste oil may count double towards the renewable share. Netherlands was the first country to introduce this measure and the only one that had it in place at the time of sampling. This attracts waste oil imports from other countries and explains the high share of waste oil in the Dutch biodiesel. This effect is likely to decrease when other countries will have the same policy in place in the near future.

7 Joint Research Centre for the European Commission (JRC), 2008.

Feedstock used for Biodiesel 2011, Europe

Biodiesel components

- Rapeseed
- Soy
- Palmoil
- Animal Fat
- Waste Oil / Fat

Biodiesel average in tested countries* 3.6 %

Country	Rapeseed	Soy	Palmoil	Animal Fat	Waste Oil / Fat
Italy (10)	3	15	37	5	40
NL (6)	23	8	3		67
Austria (10)	56	10	4	1	30
France (11)	65	28	1	6	
Germany (14)	76	8	8	2	7
Luxembourg (4)	85	8	8		
Belgium (8)	98		2		
Sweden (10)	100				
Denmark	no Biodiesel				

( ) Number of samples
* in volume percent, may not sum to total due to rounding

LUXEMBOURG

Biodiesel average in volume percent 2.3 %

Station	Rapeseed	Soy	Palmoil	Animal Fat	Waste Oil / Fat
Berchem – Aral	100				
Berchem – Shell	40	30	30		
Capellen – BP	no Biodiesel				
Capellen – Texaco	100				
Wasserbillig – Esso	100				
Wasserbillig – Total	no Biodiesel				

GERMANY

Biodiesel average in volume percent 5.5 %

Station	Rapeseed	Soy	Palmoil	Animal Fat	Waste Oil / Fat
Angermünde – Esso	70	20	10		
Berlin – Aral	70	20	10		
Bonn – Esso	85	5		10	
Dortmund – Shell	100				
Erfurt – Aral	80	10	10		
Fulda – Shell	100				
Hamburg – Esso	70	10	20		
Heide – Shell	100				
Leipzig – Total	100				
Neunkirchen – Jet					100
Nürnberg – OMV	no Biodiesel				
Oldenburg – Jet	80			20	
Schwerin – Total	40	30	30		
Speyer – Total	80	10	10		
Stuttgart – Aral	85		15		

SWEDEN

Biodiesel average in volume percent 5.6 %

Station	Rapeseed	Soy	Palmoil	Animal Fat	Waste Oil / Fat
Helsingborg – Preem	100				
Helsingborg – OK Q8	100				
Helsingborg – Shell	100				
Malmö – Preem	100				
Malmö – OK Q8	100				
Malmö – Shell	100				
Malmö – Statoil	100				
Nacka – OK Q8	100				
Saltsjöbaden– Statoil	100				
Stockholm – Jet	100				

BELGIUM

Biodiesel average in volume percent 2.7 %

Station	Rapeseed	Soy	Palmoil	Animal Fat	Waste Oil / Fat
Antwerpen – Esso	100				
Antwerpen – Q8	100				
Antwerpen – Total	100				
Brussel – Lukoil	100				
Brussel – Shell	90		10		
Brussel – Texaco	95		5		
Gent – Esso	no Biodiesel				
Gent – Shell	no Biodiesel				
Jambes – Total	100				
Jambes – Lukoil	100				

FRANCE

Biodiesel average in volume percent 6.1 %

Station	Rapeseed	Soy	Palmoil	Animal Fat	Waste Oil / Fat
Brest – Total	55	35		10	
Dijon – Intermarché	70	25	5		
Grenoble – Total	60	40			
Le Grand-Quevilly – BP	80	20			
Nantes – Leclerc	70	30			
Nice – Leclerc	40	50		10	
Nancy – Esso	75	15		10	
Nancy – Esso	80	15	5		
Paris – Carrefour	50	25		25	
Paris – Total	60	25		15	
Rennes – Carrefour	70	30			

DENMARK

Biodiesel average in volume percent < 0.1 %

Station	Rapeseed	Soy	Palmoil	Animal Fat	Waste Oil / Fat
Ålborg – Shell	no Biodiesel				
Århus – Shell	no Biodiesel				
Århus – Statoil	no Biodiesel				
Århus – Q8	no Biodiesel				
Blommenslyst – OK	no Biodiesel				
Brøndby – Shell	no Biodiesel				
Kalundborg – Statoil	no Biodiesel				
Korsør– Q8	no Biodiesel				
Nørresundby – Uno-X	no Biodiesel				
Rødovre – Statoil	no Biodiesel				

AUSTRIA

Biodiesel average in volume percent 6.7 %

Station	Rapeseed	Soy	Palmoil	Animal Fat	Waste Oil / Fat
Hall in Tirol – Esso					100
Innsbruck – OMV					100
Kirchbichl – Shell					100
Klagenfurt – Avanti	85	10	5		
Klagenfurt – OMV	75	15		10	
Klagenfurt – Shell	60	30	10		
Wien – BP	85	10	5		
Wien – Esso	85	10	5		
Wien – OMV	85	10	5		
Wien – Shell	85	10	5		

NETHERLANDS

Biodiesel average in volume percent 3.4 %

Station	Rapeseed	Soy	Palmoil	Animal Fat	Waste Oil / Fat
Amsterdam – BP					100
Amsterdam – Esso	70	20	10		
Amsterdam – Shell					100
Amsterdam – Texaco					100
Amsterdam – Total					100
Rotterdam – BP	no Biodiesel				
Rotterdam – Esso	70	20	10		
Rotterdam – Texaco	no Biodiesel				
Rotterdam – Shell	no Biodiesel				
s-Heer Arendskerke – Total	no Biodiesel				

ITALY

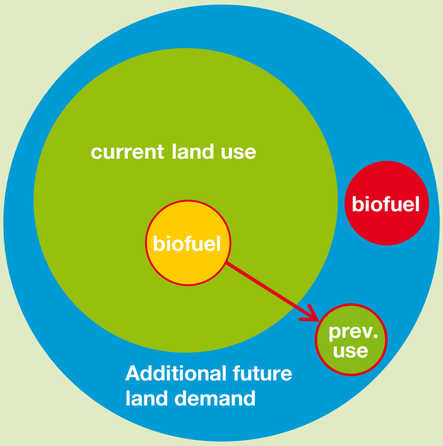
Biodiesel average in volume percent 5.8 %

Station	Rapeseed	Soy	Palmoil	Animal Fat	Waste Oil / Fat
Bari – Agip		30	70		
Bari – Total	10	35	45	10	
Genova – Esso	20	45	35		
Genova – IP		10	70	20	
Ravenna – IP					100
Ravenna – Total					100
Rome – Agip					100
Rome – Esso					100
Rome – Shell		15	70	15	
Rome – Shell		15	80	5	

Source: Greenpeace investigation on diesel, July 2011

GREENPEACE

Principle of LUC (DLUC and ILUC) Due to Biofuel Production



- LUC = additional future land demand (agriculture-food, fodder, fibre, bioenergy butalso infrastructure,settlement…) just a part of this is due to biofuel production
- DLUC of biofuels = direct conversion of natural habitats to eliminate by proof of origin (RED Art.17, 18)
- ILUC of biofuels = displacement and relocation of previous use; takes place globally

What is indirect land use change? The above figure shows that biofuel production can lead to both direct (DLUC) and indirect land use change (ILUC). ILUC occurs when existing agricultural land is turned over to biofuel production, and agriculture has to move elsewhere to meet the ongoing – and increasing – demand for food and feed crops. Often, it relocates to land formerly covered by forest, grassland, peatland, wetland or other carbon-rich ecosystem. This triggers the release of carbon locked up in soil and biomass, causing a substantial increase in greenhouse gas emissions. Besides the climate impacts, ILUC also threatens food security and can exacerbate conflicts over land rights and biodiversity loss. While these impacts are not a central focus of this factsheet, it goes without saying that they are extremely important.

EU palm oil imports have already doubled during the 2000-2006 period, mostly to substitute for rapeseed oil diverted from food to fuel uses (FAO)[8]

The greenhouse gas impacts of indirect land use change can only be estimated through modelling, as future developments will not necessarily follow past trends.

However, a recent report for the European Parliament, which reviewed scientific research in the field, including studies undertaken for the European Commission, stated: "All model exercises show that greenhouse gas emissions from ILUC caused by increased biofuel demands are significant, and the range of respective results [from recent scientific research] on greenhouse gas emissions from ILUC is comparatively small."[9]

What has become clear is that when greenhouse gas emissions caused by ILUC are included in the carbon footprint calculation of biofuels, the climate benefits of these fuels compared to conventional fossil fuels can be negligible or even negated.

This was illustrated further when, in June 2011, an article in the European Voice[10] released the (as-yet-unpublished) findings of a European Commission impact assessment of the ILUC effect of biofuels.

According to the article, the impact assessment has found that biofuels derived from oilseeds will fail to meet EU requirements for greenhouse gas savings in 2020, regardless of the methodology used to calculate the ILUC side-effects. Worse, some of these biofuels – those derived from palm oil, soybean and rapeseed – produce more greenhouse-gas emissions than fossil fuels once their ILUC side-effects are taken into account.

EU and Biofuels

Emissions from biofuels relative to emissions from fossil fuels, without and with indirect land-use change emissions taken into account

	Without	With
Palm oil	-39	+ 15
Soybean	-43	+ 13
Rapeseed	-50	+5
Maize	-57	-47
Sugarcane	-70	-54

(grams of carbon dioxide per megajoule)

Source: EC impact assessment report according to the European Voice

The figures reveal that types of biofuels that come to the EU market bring no or little benefit to the climate and some are even worse for the climate than the fossil fuels they are designed to replace.

8 Thoenes, P. (2006): Biofuels and Commodity Markets – Palm Oil Focus. Rome: FAO Commodities and Trade Division. www.rlc.fao.org/es/prioridades/bioenergia/pdf/commodity.pdf.

9 Fritsche, U.R. and Wiegmann, K. (Oeko Institut, 2011). Indirect Land Use Change and Biofuels. Study IP/A/ENVI/ST/2010-15 for the European Parliament, Directorate-General for Internal Policies, Policy Department A: Economic and Scientific Policy, http://www.europarl.europa.eu/activities/committees/studies/download.do?language=en&file=35128#search=%20biofuels

10 http://www.europeanvoice.com/article/imported/commission-study-questions-co2-benefits-from-eu-biofuel/71400.aspx.

Land-use impacts of biofuels for each member state

Information in EU countries' National Renewable Energy Action Plans (NREAPs) can be placed alongside the ILUC impacts of biofuels to calculate the impact of biofuel consumption in each EU country in terms of land area.

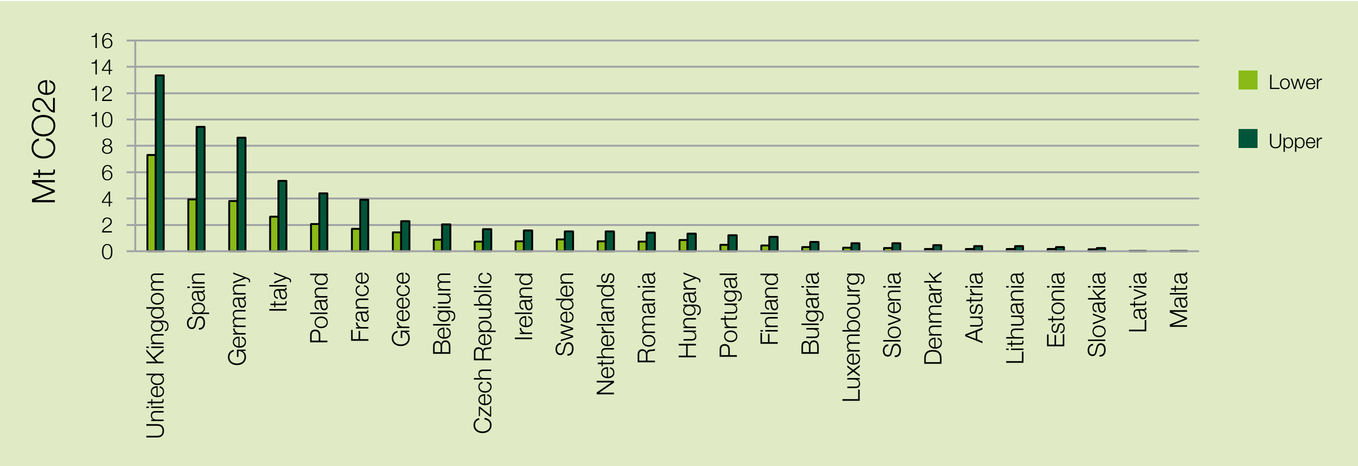
The Institute for European Environmental Policy (IEEP) calculated the land areas shown in the next table by combining results from agro-economic modelling studies with the volume of biofuels that EU member states anticipate using by 2020.

According to that calculations, the additional consumption of conventional biofuels by 2020 would indirectly require a significant expansion of cultivated agricultural land. Some 4.7 to 7.9 million hectares would be affected, equivalent to an area ranging from the size of the Netherlands, at the lower estimate, to an area just short of the size of the Republic of Ireland, at the higher.

This indirect land use change would lead to an increase in EU greenhouse gas emissions of 313-646 million tonnes of carbon dioxide equivalent (for the period 2011 to 2020) or 31-65 MtCO2e annually. This is equivalent to putting between 14 and 29 million new cars on the road by 2020.

Table: Estimated ILUC per EU member state associated with increased demand for conventional biofuels between 2008 and 2020. (Source: IEEP, 2011)

Country	Lower estimate of total ILUC - 1000 ha	Upper estimate of total ILUC - 1000 ha
United Kingdom	1044	1615
Spain	647	1167
Germany	606	1059
Italy	395	651
Poland	318	538
France	273	481
Greece	192	273
Belgium	142	251
Sweden	126	183
Ireland	117	195
Czech Republic	117	206
Hungary	114	160
Netherlands	113	183
Romania	107	172
Portugal	83	150
Finland	74	135
Bulgaria	51	87
Luxembourg	43	77
Slovenia	42	76
Denmark	30	56
Austria	28	48
Lithuania	28	48
Estonia	25	40
Slovakia	22	32
Malta	3	4
Latvia	3	5
Total	4742	7891



Total extra greenhouse gas emissions anticipated from EU countries' 2020 plans (MtCO2e = million tonnes of carbon dioxide equivalent): (Source: IEEP, 2011)

The results underline the need to address as a priority the question of ILUC due to biofuels production, and to include ILUC in the criteria for assessing whether biofuels should count towards the delivery of targets under the EU-RED for 2020 and, more generally, for EU climate change mitigation goals.

They also raise urgent questions about EU country projections for conventional biofuel use by 2020. Few of the NREAPs focus on increasing the use of renewable electricity to power cars and trains; on improving vehicle efficiency overall (e.g. using lighter and smaller vehicles with more efficient engines); or on switching to less energy-intensive modes of transport and reducing overall transport demand.

The way forward

Under the EU Renewable Energy Directive, the European Parliament and Council asked the European Commission to introduce a "concrete methodology for emissions from carbon stock changes caused by indirect land-use" based on the best available science and to report back on the issue by December 2010. In response, the Commission commissioned several studies to examine the ILUC effect of biofuels.[11] It is currently finalising a report– to summarise the research findings and assess potential policy options.[12]

The following options to include the ILUC effect in the EU-RED are being examined by the Commission:

Option 1 - take no action for the time being, while continuing to monitor the situation;
Option 2 - increase the minimum greenhouse gas saving threshold for biofuels and bioliquids;
Option 3 - introduce additional sustainability requirements for certain categories of biofuels and bioliquids;
Option 4 - attribute a quantity of greenhouse gas emissions to biofuels to reflect the estimated indirect land use change impact.

Greenpeace recommendations

- Legislation is the best and only reasonable approach to prevent indirect land use change that would otherwise turn biofuels into a new driver of climate change.
- The Commission should urgently publish a legislative proposal requiring energy suppliers to reflect emissions from ILUC for different biofuel crops in the total carbon footprint calculation of biofuels. Continuing to exclude these emissions presents a misleading picture of the real impact of biofuels. Including them would provide a reliable means to differentiate between biofuels that are good for the climate and those which are not.
- There is a serious danger that, if the policy does not change, the national renewable energy action plans (NREAPs) submitted to the Commission last year will lead to a greater use of biofuels that increase rather than reduce emissions. The increased cultivation of these crops also threatens to damage biodiversity, encourage unsustainable agricultural practices, exacerbate rural conflict and land-grabbing in developing countries, and push food prices upwards.
- EU countries need to move beyond the single-option biofuels approach outlined in their NREAPs and aim to meet the 10% renewable transport fuel target sustainably, by developing a credible multi-pronged strategy. By prioritising energy saving by using lighter and smaller cars with more efficient engines, shifting to less energy-intensive modes of transport, reducing overall transport demand and powering cars and trains with renewable electricity, the use of biofuels in EU countries should be limited to levels that can be met from truly sustainable sources, such as waste and residues with no alternative purpose.

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

12 European Commission (2010). Report COM(2010) 811 final from the Commission of 22 December 2010 on indirect land-use change related to biofuels and bioliquids, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0811:FIN:EN:PDF.