



**Anticipated Indirect Land Use Change from Expanded Use
of Biofuels in the EU –
An Analysis on the basis of the National Renewable
Energy Action Plans**

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*Study Anticipated Indirect Land Use Change
Associated with Expanded Use of Biofuels and
Bioliquids in the EU –An Analysis of the National
Renewable Energy Action Plans*

Catherine Bowyer (November 2010)

Commissioned by T&E, Action Aid, Birdlife
International, ClientEarth, EEB, Fern, FoE, Greenpeace
and Wetlands International

Here: Update to include all 27 NREAPs



- Renewable Energy Directive '*RED*' (2009/28/EC). Targets:
 - **20%** renewable energy of gross final energy consumption in the EU in 2020
 - Differentiated national binding targets (PL: 15% in 2020)
 - **10%** renewable energy in transport in 2020 **in each Member State**
- National Renewable Energy Action Plans (NREAP):
 - National 'renewable energy pathways' to 2020; **basis of our analysis**



- Renewable energy target: 15% in 2020 (2005: 7.2%)
- Biofuel share in 2008: 3.3% (Eurostat)

NREAP:

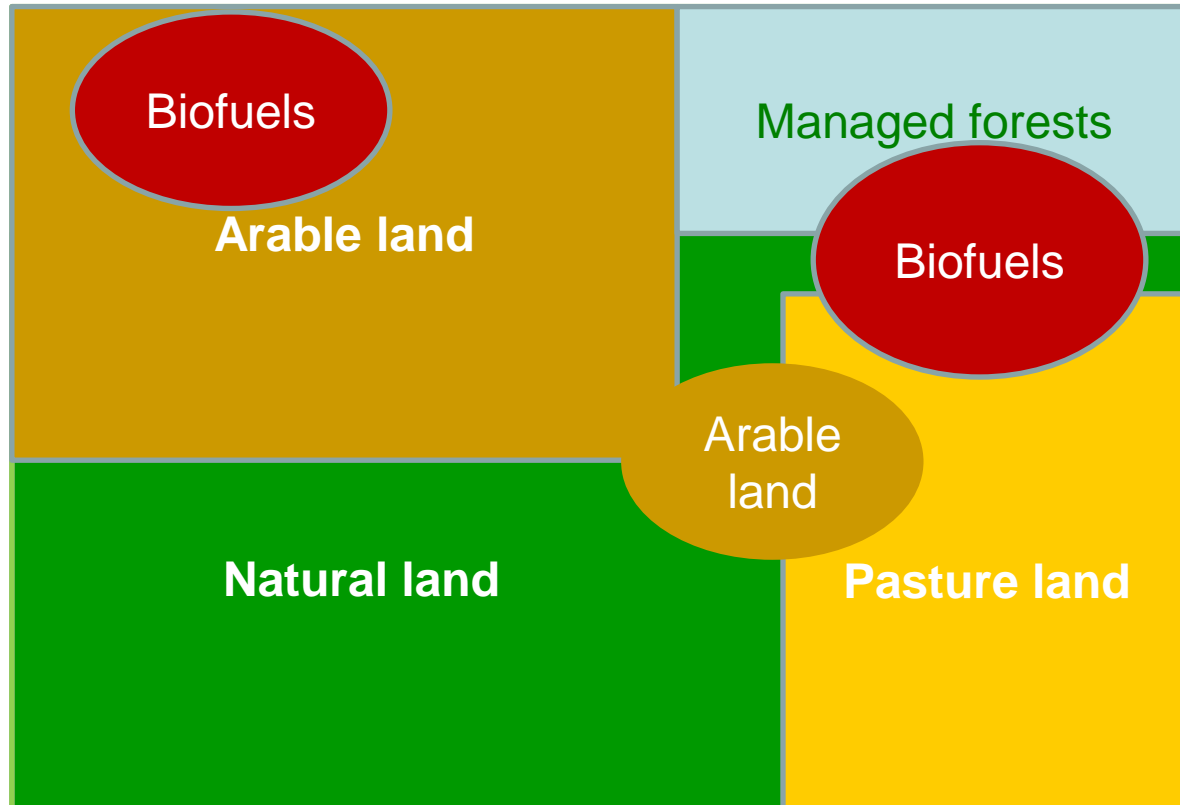
- Share of conventional biofuels of total transport energy: 9% in 2020 (1.73 Mtoe) +1.3% second-generation/waste-based fuels
- Split bioethanol-biodiesel in conventional biofuels: 24%-76%
- Imports: 100% domestic production in 2020, but in 2009/2010 imported biofuels still accounted for about 40%-50% of domestic consumption

Sustainability criteria for biofuels and bioliquids



- Require minimum greenhouse gas (GHG) savings compared to fossil alternatives of 35% in 2011 rising to 50% 2017 and 60% from 2018 (for new plants) – including emissions from direct land use change
- Limits direct land use change by banning the use of biofuels/ bioliquids sourced from land that in January 2008 had
 - high biodiversity value or
 - high carbon stocks
- Indirect impacts and land use change:
 - European Commission report *on indirect land-use change related to biofuels and bioliquids* published in Dec 2010 but final decision on whether legislative action on ILUC will be taken outstanding (July 2011)

What is indirect land use change?





IEEP's analysis in 5 steps

Our analysis in 5 steps

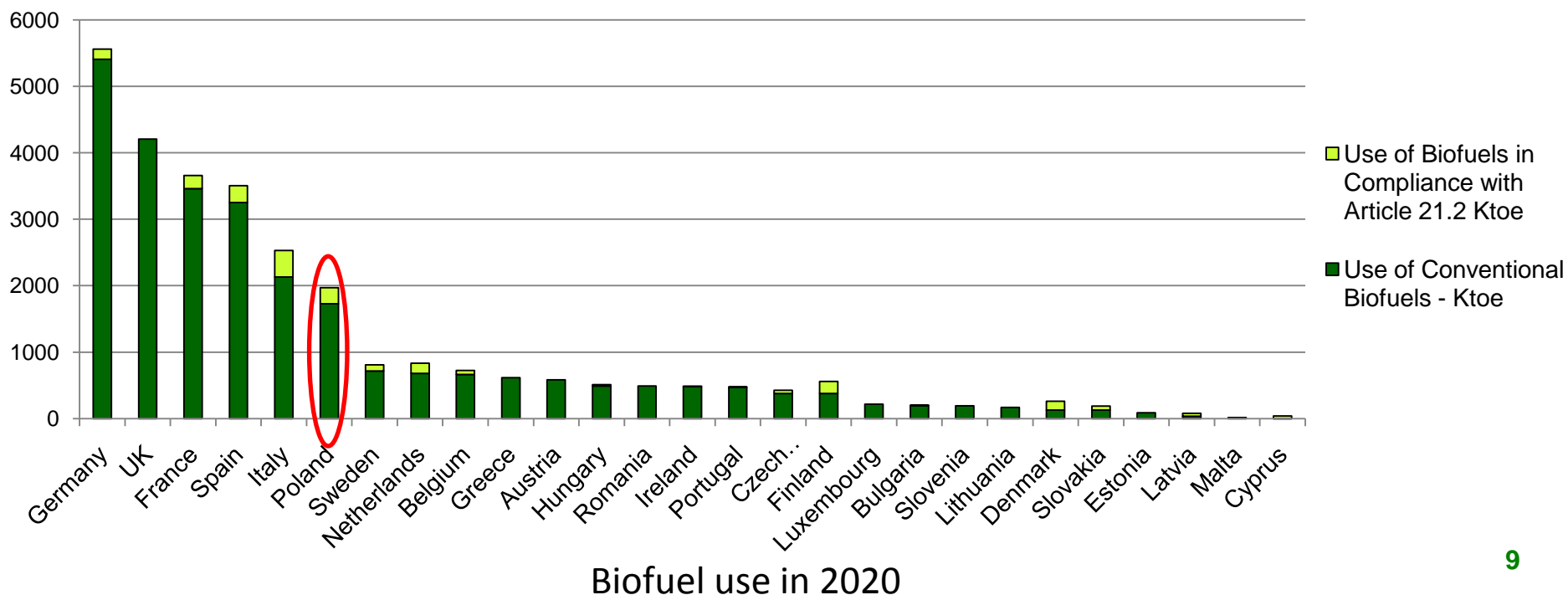


Step	
1	NREAP data on biofuel demand per Member State
2	Identification of increase in conventional biofuel use by 2020 attributable to the RED target
3	Calculation of anticipated ILUC area associated with the increase in biofuel use
4	Calculation of the GHG emissions associated with ILUC
5	Converting the ILUC estimates into meaningful proxies

Step 1: Biofuels in the NREAPs



- **9.6%** of energy in transport in the EU will be sourced from biofuels **in 2020**
- Primarily (**>90%**) from **conventional feedstocks** such as cereals, oilseeds, sugar crops → 8.8% of energy in transport in 2020 (27.3 Mtoe)
- MS neglect potentially less environmentally damaging advanced biofuels from eg waste and ligno-cellulosic sources (wood): '*2nd generation / Article 21(2)*' biofuels
- **72% of biofuels** will be **biodiesel** in 2020
- Many MS rely on a **considerable proportion of imports**: average import share is 44% for bioethanol and 36% for biodiesel in 2020



Step 2: Increase in demand



- Baseline: Biofuel use in 2008 (EurObserver)

$$+Demand = 2020 \text{ use} - \text{Advanced fuel use} - 2008 \text{ use}$$

- Land use effects of 2nd generation biofuels are not well researched and understood yet
- Increase of conventional biofuel use 2008-2020 triggered by the RED (*+Demand*):

17.2 Mtoe → **Basis of our analysis**

- The **UK, Spain, Germany, Italy, Poland (1.18 Mtoe)** and France account for 70% of the additional conventional biofuel demand between 2008 and 2020

Step 3: ILUC calculation – area



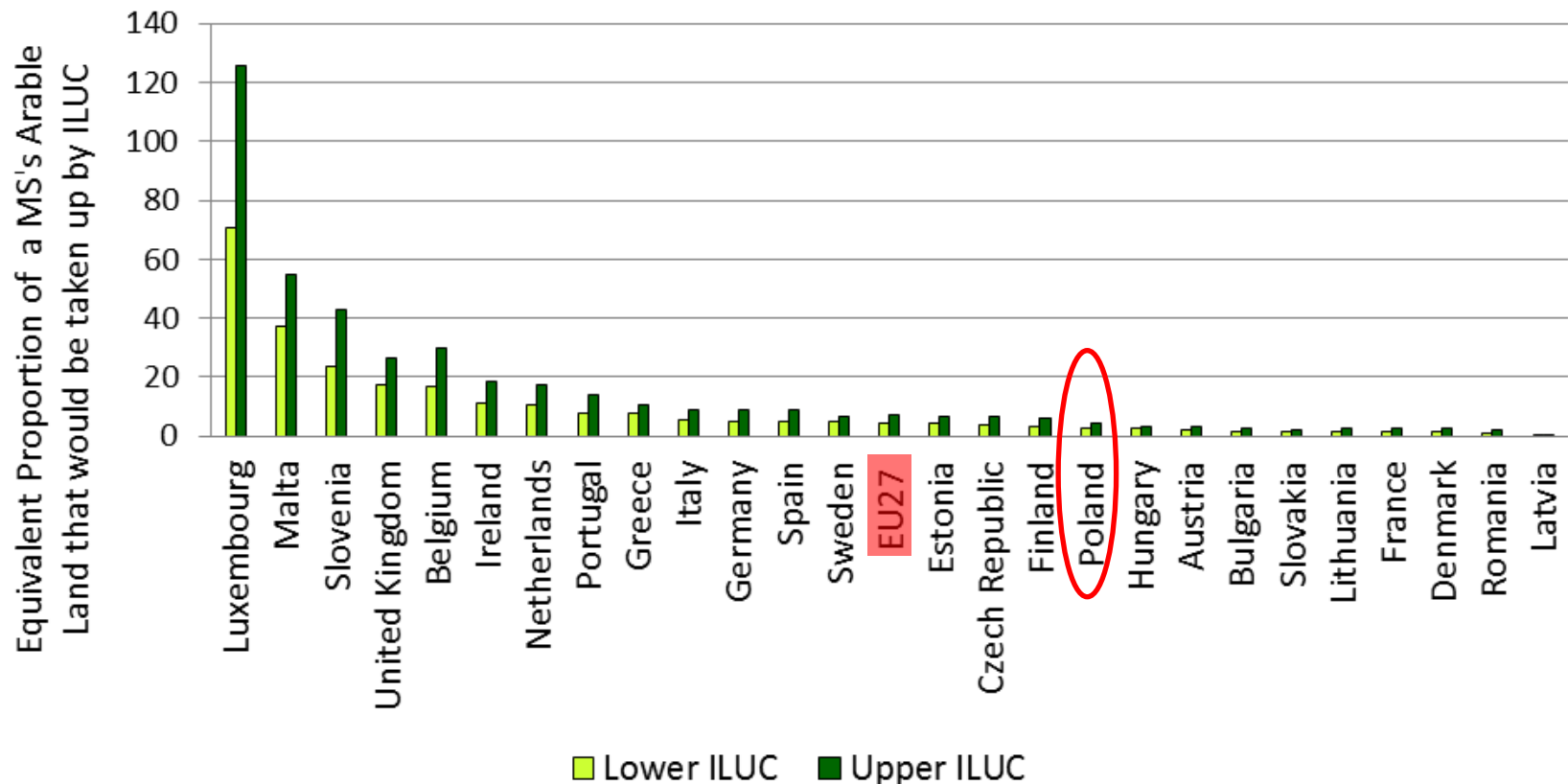
ILUC area derived from multiplying the extra demand with ILUC conversion factors

- **ILUC factors** (area impact per Ktoe of bioethanol and biodiesel) from economic modelling studies (as compared by *Joint Research Centre*)
- Upper and Lower estimates – to reflect the range of model results
- Key limitation of the study is that we have to use generic values for ILUC per biofuel type, not able to distinguish in more detail feedstock source etc due to limited info in the NREAPs
- Assumptions:
 - Lower and upper outliers excluded (expert advice by *Joint Research Centre*)
 - Biodiesel calculations based on oilseed values
 - Bioethanol calculations based on values for EU wheat for domestic production and sugar cane for imports (latter with a much lower ILUC impact)

Step 3: ILUC calculation – area



- The ILUC impacts attributable to additional conventional biofuel usage by 2020 in the EU are between **4.7 and 7.9 million ha**
- This corresponds to 15% - 25% of the area of Poland; or at the lower end an area just smaller than the Netherlands and at the upper end an area just under that of the Republic of Ireland

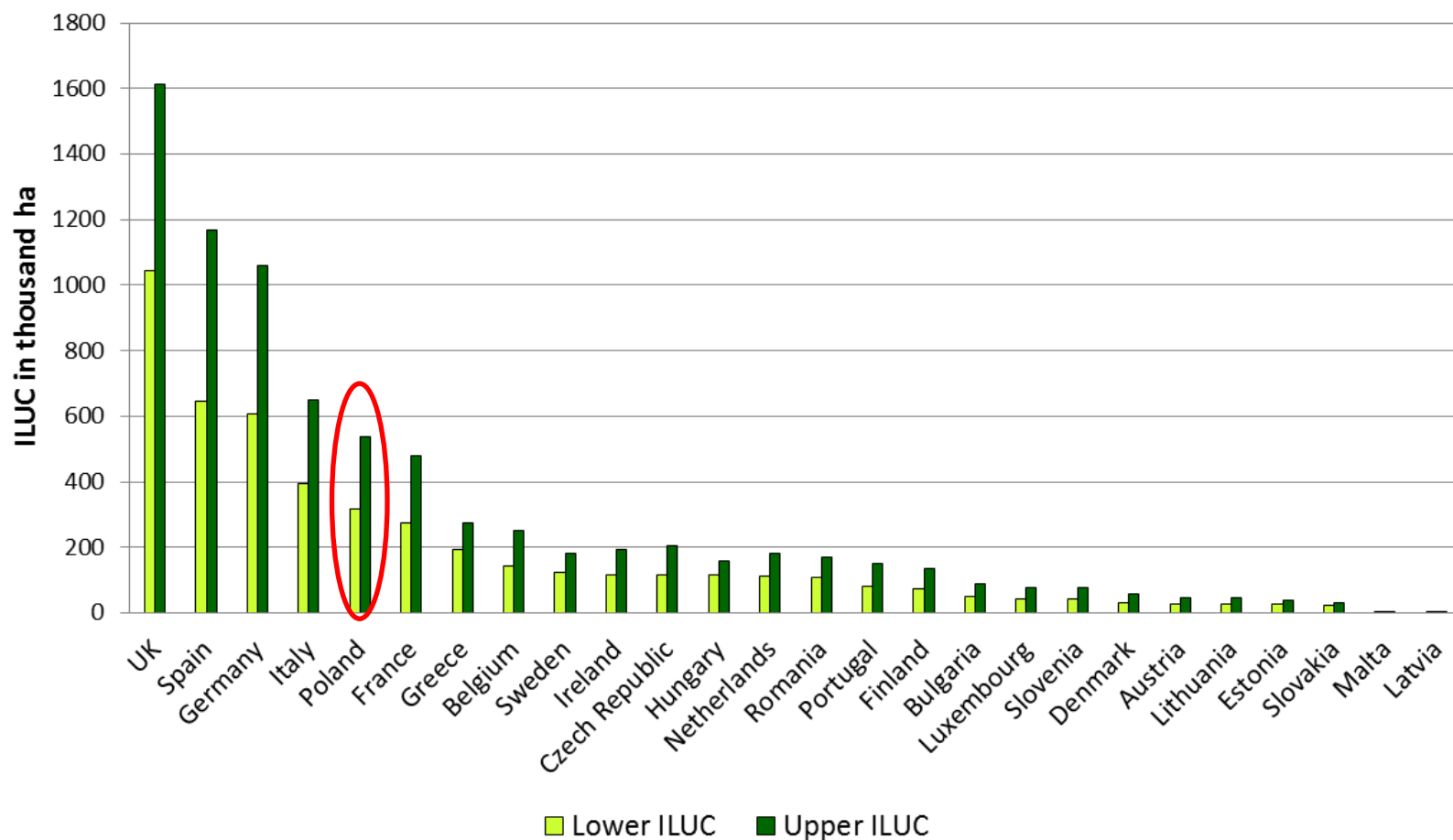


Step 3: ILUC calculation – area



Absolute ILUC area per Member State:

Poland lower-upper ILUC: 318 – 538 thousand ha = 2.5 – 4.3% of Polish arable land



Step 4: Greenhouse gas emissions



Approach:

- Use of default values to calculate GHG emissions per unit of ILUC area converted \rightarrow tC/ha (tC \rightarrow CO₂ equivalent)
- We use a mean value for GHG emissions to represent results – allows variability in emissions from land use to be taken into account (the mean of 57 tC/ha is similar to temperate grassland value)
- One-off hit of emissions converted to annualised emissions spread over a 20-year time horizon according to the RED

Results:

- Annualised EU 27 emissions are between **50 and 83 Million** tonnes of CO₂ equivalent
- This corresponds to 13 – 21% of the total GHG emissions of Poland in 2007 or, at the upper end to:
 - 18% of emissions from the EU's agricultural sector, or
 - 8% of total EU transport emissions in 2007

Step 4: Additional GHG emissions from biofuel use



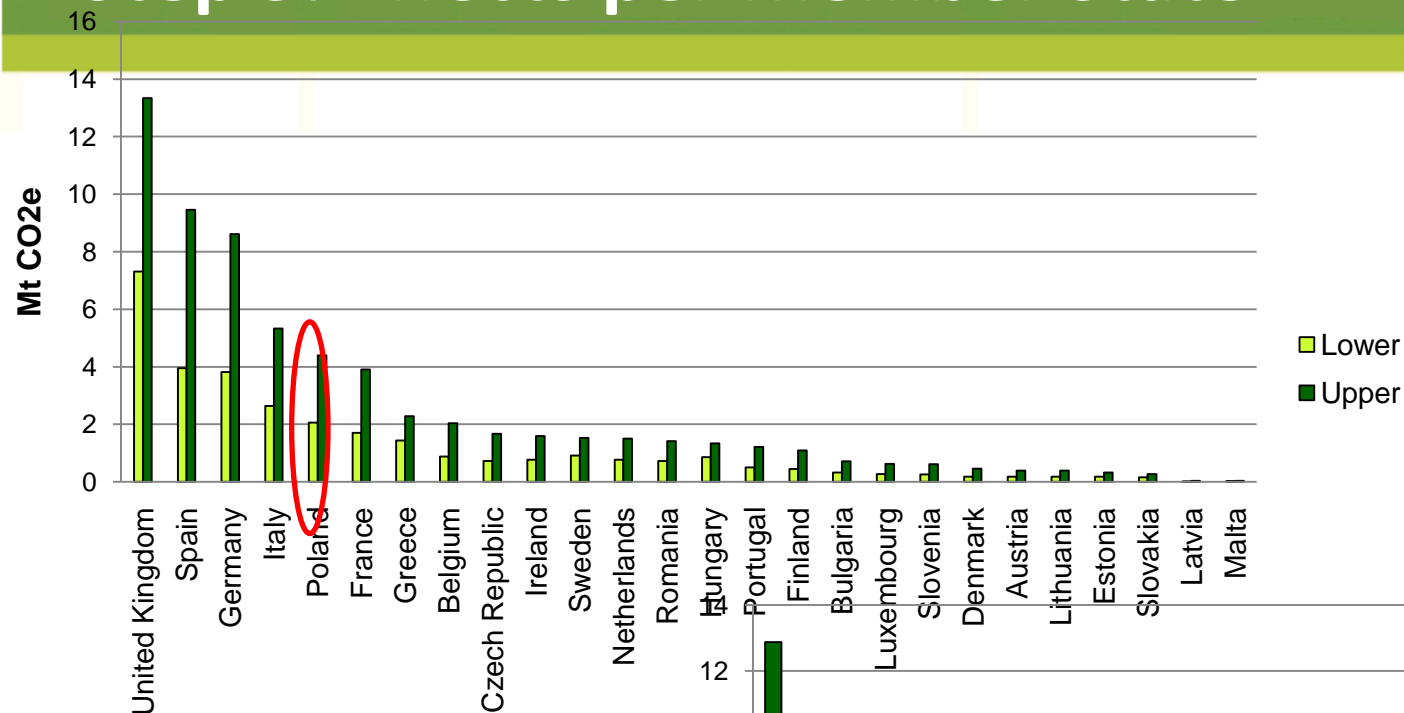
Why?

- Biofuels under the RED are required to deliver GHG reductions of a certain proportion
- These are subtracted from ILUC emissions hence providing details of how much additional emissions will result from biofuels if ILUC is not addressed – compared to meeting the same demand with fossil fuels

Results

- Total additional emissions associated with the increased use of biofuels including ILUC are anticipated to range from **313 to 646 MtCO₂e for 2011-2020**
- Annualised emissions would be **between 31.3 and 64.6 MtCO₂e**
- Total emissions equivalent to placing between **14.2 and 29.2 million additional cars** on European roads in 2020 (PL share: 0.9 to 2.0 million cars)
- Over 2011-2020, this can be estimated to lead to between **81% and 167% more GHG emissions** than if the same fuel need were met using fossil diesel and petrol

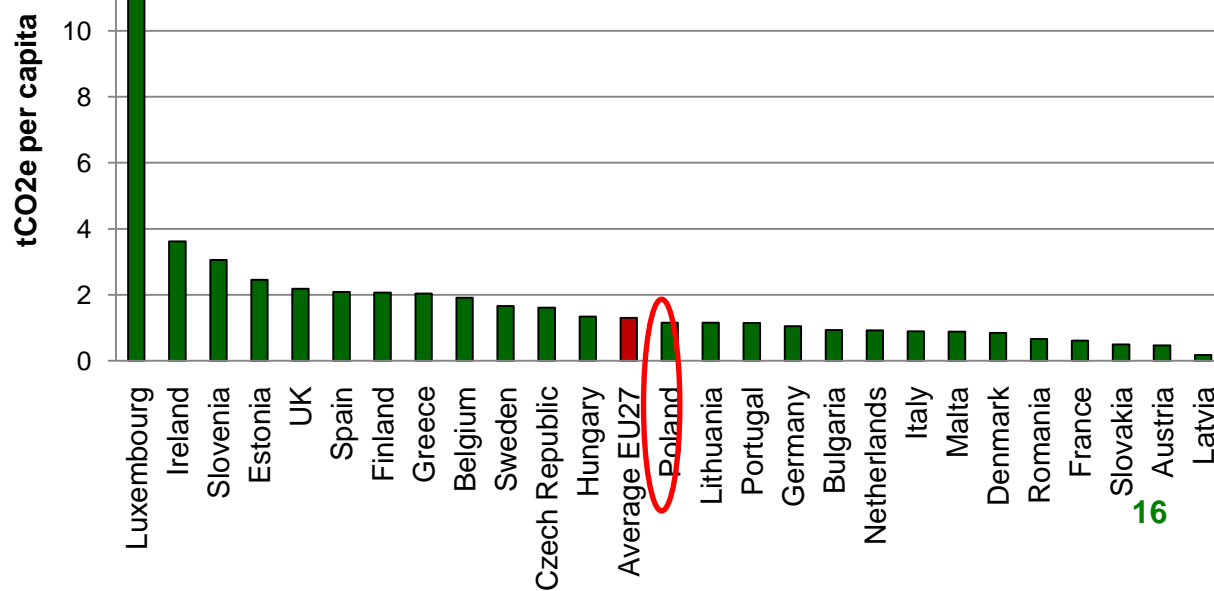
Step 5: Effects per Member State



Additional GHG emissions per MS, annualised

PL: 2.1 – 4.4 MtCO₂e
 = 0.5 – 1.1% of total Polish GHG emissions in 2007

Additional *per capita* emissions per MS, annualised



Conclusions



Main messages

- The anticipated additional biofuel use up to 2020 would lead to indirect land use change causing substantial additional GHG emissions
- Sensitivity analysis shows that even with lower ILUC assumptions additional GHG emissions will occur

Caveats

- Aim to be transparent in terms of approach and independent in our analysis
- Research into this area is ongoing, therefore work completed based on the best available data at the time of drafting
- Assumptions could be improved with better knowledge on:
 - the assumptions and factors that dictate the scale of ILUC so as to decrease variability across models; and
 - the location of biofuel production and feedstock types

Conclusions



Policy messages

- For conventional biofuels to be justified as delivering GHG emission and used for compliance with RED targets ILUC needs to be taken into account: the RED was intended to deliver GHG savings in the transport sector and ILUC would undermine this
- Need to shift the focus away from the 'easy option' of expanded conventional biofuel use towards increased use of alternatives ie improving energy efficiency and use of advanced biofuels



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Thank you!

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