Policy Brief on Indirect Land Use Change and Peatlands

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Biofuel production on peatlands increases greenhouse gas emissions

Wetlands International recognises a potential role for biofuels in terms of emission reductions compared to fossil fuels. However, under current practice, biofuels often have large negative impacts on (high carbon) natural ecosystems. In such cases, the expansion of biofuel crop production leads to higher rather than lower greenhouse gas (GHG) emissions when compared to fossil fuels, due to both direct and indirect impacts.

This is specifically the case if biofuel crops are grown on peatlands (direct land use and land-use change) or if the existing agricultural land that is replaced by a biofuel crop expands into high carbon ecosystems (forests and/or peatland) elsewhere (indirect land use change) to meet the demand for food and feed crops, thereby emitting large amounts of GHGs.

Direct and indirect impacts of biofuel crops in terms of emissions are similar and depend on the area of land that is affected, the forest type that is converted and/or the peat drainage depth. The two main sources of emissions are:

1) the conversion of forest – in case a forest is removed for the biofuel crop (direct) or in case a crop is displaced by the biofuel crop (indirect); and/or

2) drainage[1] of peatland for the biofuel crop (direct) or for the crop that is displaced by the biofuel crop (indirect).

Additional sources of emissions are peat fires and forest fires that are triggered by peatland drainage, as well as off-site impacts as a result of peat drainage[2].

Peatlands and climate change

Peatlands are wetland areas with organic soils (peat). Due to the high carbon content of peat soils, global peatlands are estimated to contain **twice as much carbon as all forests** in the world put together. Nevertheless, these enormous carbon stores are currently being degraded at a rapid pace, causing them to emit approximately **6% of all anthropogenic GHG emissions.**

[1] Peat soils are naturally waterlogged. Drainage of peat soils for productive use exposes the peat to air and causes the peat to oxidise. Oxidation results in the emission of the carbon stock of the peat soil in the form of CO_2 and contributes greatly to soil subsidence – a process whereby, in the case of continued drainage, the soil sinks progressively, increasing flood risks over time. This process continues until all peat is released to the atmosphere as CO_2 or until the drainage base is reached. It may also be stopped through peatland rehabilitation.

A key difference between emissions from the drainage of peatland and emissions from the conversion of forest (ie, above-ground biomass) is that peat emissions continue for as long as drainage continues – meaning that emissions are continuous over decades or even centuries, while forest conversion related emissions are one-off emissions. CO_2 emissions from peatlands in their natural waterlogged state are close to zero or even negative (as carbon is being sequestered).

The issue of direct impacts and indirect impacts of biofuel production on peatlands is significant in producing countries in the tropics as well as in the temperate zone (e.g. the EU itself). The best and most recent estimate[3] for GHG emissions from agricultural practice on tropical peatlands (such as oil palm plantations) is 64 t CO_2 ha^{-1} yr^{-1} [4,] , which is in line with the Hooijer equation and Couwenberg equation (9 t CO_2 ha^{-1} yr^{-1} per each 10 cm of drainage depth)[5] and which is higher than the conservative value that is used in the Commission's impact assessment (57 t CO_2 ha^{-1} yr^{-1}). Emissions in the temperate zone are lower but still significant. 75 per cent of cropland and grazing land emissions in the EU are from peatlands, covering less than 5 per cent of the agricultural land surface[6].

ILUC emissions from peatlands are significant

Even though exact numbers on ILUC are not available yet, the European Commission has concluded that ILUC is significant in carbon and GHG accounting, especially in the case of oil palm[7].

Table 1 shows the most recently published research on the conversion of peat swamp forest in Southeast Asia to other land use (both forest conversion and peat drainage). This conversion is for a large part directly or indirectly related to the increase in biofuel production as illustrated in Table 2.

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[2] Peatlands are inextricably linked to water systems. Draining a certain area of peat (for instance in order to plant oil palm) often leads to a lowering of the water table in adjacent areas, which may not be under productive use. This indirect drainage leads to high CO_2 emissions from these adjacent peat areas.

[3] Hooijer, A. & Couwenberg, J. (accepted) Towards robust subsidence-based soil emission factors for peat soils in Southeast Asia, with special reference to oil palm plantations. Mires & Peat.

[4] This amounts to over 160 million tonnes of direct CO_2 emissions per year from peat soil oxidation in oil palm plantations on peatlands in Southeast Asia, i.e. excluding ILUC (food crops moving into peatlands as a result of replacement by biofuel crops).

[5] Hooijer, A., Page, S., Canadell, J. G., Silvius, M., Kwadijk, J., Wösten, H., and Jauhiainen,J. 2010. Current and future CO2 emissions from drained peatlands in Southeast Asia, Biogeosciences, 7:1505–1514.
Couwenberg, J., Dommain, R. & Joosten, H. 2010. Greenhouse gas fluxes from tropical peatlands in south-east Asia. Global Change Biology, 16, 1715-1732.

[6] Annual European Union greenhouse gas inventory 1990 – 2010 and inventory report 2012 (Submission to the UNFCCC Secretariat: http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/6598.php).

[7] European Commission Impact Assessment (SWD (2012) 343 final)

Table 1. Peat swamp forest loss (%) for different areas in Southeast Asia, for different periods in time.

Area	Period	Reference	Peat swamp forest converted to other LU
			% of peat forest (average)
Insular SE Asia	2000-2005	WI Malaysia 2010	1.47
Sarawak, Malaysia	2005-2007	SarVision 2011	7.1
Sarawak, Malaysia	2009-2010	SarVision 2011	8.9
Malaysia and Indonesia	2000-2010	Miettinen et al 2011	2.2
Borneo	1997-2002	Fuller et al 2004	2
Indonesia	1990-2000	Hansen et al 2009	1.5

Table 2. Land cover changes in (1970's – 2009/2010) in Sumatra (Miettinen et al., 2012).

Land Cover	North Sumatra		Riau		Jambi			
					Outside Berbak nat park		Inside Berbak nat park	
	1977	2009	1979	2010	1970's	2009	1970's	2009
Nearly pristine forest	190.8	0	202.4	5.56	183	53.1	120.1	92.2
Mod. Degr. forest	14.6	2.9	0.6	2.23	8.2	14.9	5.3	5.5
Heav. Degr. forest	0.6	11.1	0	7.5	2.4	29.3	0	1.8
Secondary forest	4.6	5.1	0	1.8	0.1	18.0	0	5.2
Clearance/burnt	0	10.8	0	12.6	0	4.3	0	1.1
Smallholder mosaic	10.7	69.1	7	11.9	7.3	17.6	0.1	0.7
Industrial plantation	1.9	87.9	0	6.07	0	27.9	0	0

Areas are given in ha x 10^3

Drainage of peatlands is unsustainable

In addition to large CO_2 emissions, drainage of peat also leads to soil subsidence and subsequent increased flooding risk, and to salt water intrusion in coastal areas. In the long term it results in the unsuitability of this land for any form of agriculture, unless flooding can be mitigated through dikes and pumping (like in some countries in Europe). It is very questionable whether this can be done practically in the tropics, or if this would represent a cost effective solution. It would require many thousands of kilometres of coastal and river dikes and a huge amount of pumping capacity in view of the much higher and concentrated (rainy season) precipitation. In any case, as a result of the continuous soil subsidence (on average 5 cm per year) oil palm cultivation on peat inevitably results over time in drainage of previously undrained soil layers, which is in direct contradiction with the sustainability requirements of the EU Renewable Energy Directive.

EU rules on biofuels and proposals on ILUC are inadequate

Current EU law (the Renewable Energy Directive (RED) and the Fuel Quality Directive (FQD)) excludes biofuels and bioliquids from being counted towards emissions reduction targets and from receiving subsidies if they are made from raw material from land that was peatland in January 2008 (unless evidence is provided that the cultivation and harvesting of that raw material does not involve drainage of previously undrained peat soil)[8].

Nevertheless, the current lack of ILUC monitoring and accounting means that large quantities of biofuels with high ILUC impacts may be used in the EU – such as biofuels made from palm oil. The Commission proposal on ILUC acknowledges this problem, and suggests that it can be addressed by making the reporting of ILUC emissions compulsory. However, the Commission fails to introduce actual accounting of ILUC emissions – meaning that unsustainable biofuels might continue receiving public aid and being counted towards emissions reduction targets, even though the reporting shows that they in fact lead to negligible emissions savings or even to higher emissions than fossil fuels. The proposal by the Commission is therefore insufficient to properly address ILUC impacts.

Effectively addressing ILUC emissions from peatlands

- ILUC factors for biofuel crops should be immediately included in GHG accounting, starting with conservative proxies at a minimum.
- ILUC factors and sustainability criteria for each biofuel stock should include peat-related emissions (if relevant). These factors should be used for mandatory reporting and accounting of GHG emissions and carbon fluxes related to the production of stocks that lead to displacement.
- ILUC factors must take into consideration the continuous nature of emissions from peat conversion (as opposed to the one-off emissions from forest conversion).
- Stricter monitoring of the provenience of biofuel stocks should be in place, to ensure full traceability and compliance with the sustainability criteria in the RED and FQD.
- Biofuels that do not lead to emissions reductions compared to fossil fuels, but rather lead (directly and/or indirectly) to an increase in emissions and ecosystem destruction should not count towards emission reduction targets nor receive public financial aid. GHG accounting must be transparent and mandatory, and biofuels must comply with the sustainability criteria included in the RED and FQD.
- Accounting must be based on actual GHG emissions and savings, and not on any form of "creative accounting". Ascribing emissions savings to biofuels which have comparable or higher emissions than

[8] RED, Article 17 (5); FQD Article 7b (5)

fossil fuels should be prohibited, in the same way that quadruple counting of savings from “advanced biofuels” should not be allowed.

Facts about peatlands and greenhouse gas emissions

Peatlands are waterlogged wetland areas with organic soils (peat), which result from the accumulation of dead plant material over thousands of years. Peatlands cover only about 3% of the total global land surface, but they store around 550 Gt of carbon – double the amount of carbon stored in the biomass of all the world’s forests.

These **huge carbon stores** are disappearing at an alarming rate. In Southeast Asia, the deforestation rate of tropical peat swamp forests is twice that of other forests. Over 90% of peat swamp forests in the region has been converted, drained or logged. The rapid expansion of oil palm plantations is accelerating this loss. Nevertheless, peatland degradation and loss is not limited to the tropics. Many countries in Europe have lost their natural peatland heritage due to agriculture, forestry and peat mining.

Two billion tonnes of CO_2 are emitted annually as a result of peatland drainage and reclamation, mainly for forestry and agriculture. This is equivalent to **6% of the global anthropogenic CO_2 emissions**, and represents almost 25% of the total carbon emissions from the land use, land use change and forestry (LULUCF) sector. Unlike deforestation, which causes one-off and almost immediate emissions, the **emissions from drained peatlands continue for decades and even centuries** as long as the land remains drained and the peat keeps oxidising. Fertilisers for agriculture on peatlands lead to high emissions of nitrous oxide, while drainage channels result in emissions of methane; both very potent GHG’s.

About Wetlands International

Wetlands International is the only global not-for-profit organisation dedicated to the conservation and wise use of wetlands. Our vision is of a world where wetlands are treasured and nurtured for their beauty, the life they support and the resources they provide.

Wetlands International is a leading expert on environmental matters related to the production of palm oil in Southeast Asia. In our role as experts in the GHG working group of the Roundtable for Sustainable Palm Oil and as external reviewers of documentation and guidelines on emission factors for the Intergovernmental Panel on Climate Change, we provide expertise regarding palm oil production, forest and peatland degradation due to direct and indirect land use (change), and its related emissions and other impacts (such as soil subsidence and loss of biodiversity).

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