Forest carbon to offset emissions from the EU refining and/or road transport sector

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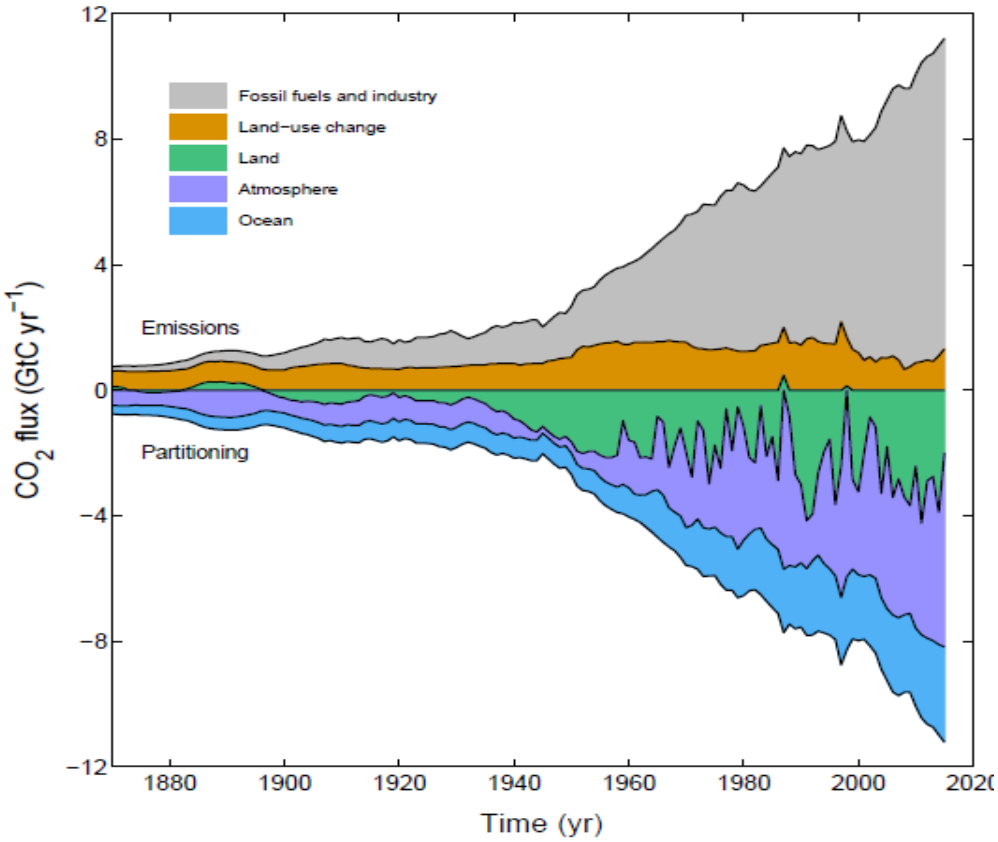
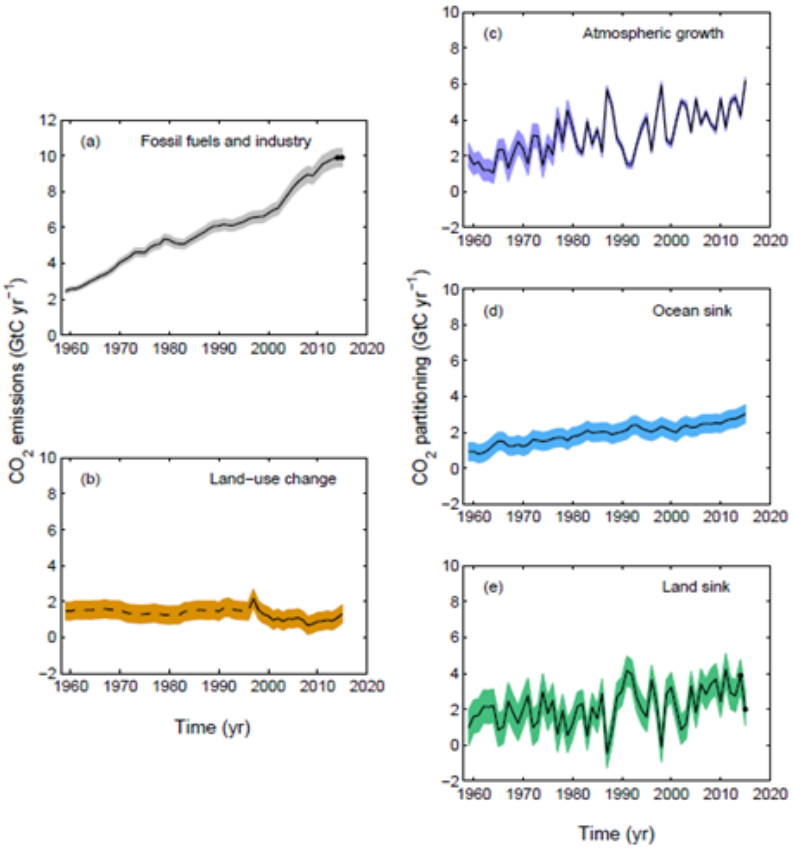
Rationale

- Changing regulatory and market environments provide a strong incentive to better understand options to reduce the sector's CO_2 footprint.
- Carbon credits including from forest carbon may be used to offset emissions from the EU refining and road transport sector.
- Carbon offsets may provide an option to cost-effectively enhance the environmental performance of road fuels.
- However understanding the technical, economic and policy environment is essential.

The global carbon balance





- Land based (LULUCF) emissions contribute around 1 ± 0.5 Gton C/year to global CO_2 emissions (period 2006-2015)

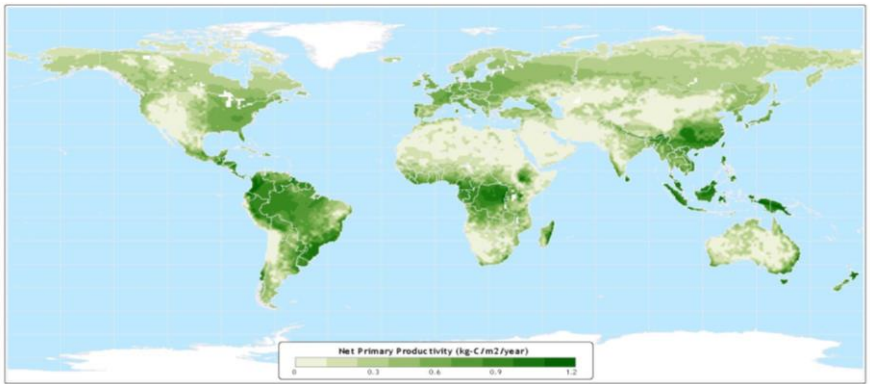
Forest carbon

- Temperate and boreal zones: increases in carbon stocks over time due to expansion of the forest cover
- Tropical zones: net emissions highest in the tropics, from land use, land use change and forestry (LULUCF)
- Emissions from peat lands (marshes):
  - Peat oxidation leads to an emission of around 0.3-0.6 Gton C world-wide, most of this in the tropics.
  - Peat fires add another 0.1 - 0.5 Gton C (El Niño effect).

Peat lands in the Netherlands and Indonesia →

Forest carbon credit projects

- Three types of forest carbon projects:
  - Reforestation and afforestation (tree planting)
  - Enhanced forest management (plus agroforestry)
  - REDD : Reduced Emissions from Deforestation and Forest Degradation) (/REDD+)
- REDD projects claim carbon credits from avoided deforestation (i.e. the conservation of forests that would otherwise be logged or converted)
- REDD projects are increasingly important in terms of market share; they are confined to the tropics



Forest productivity across the globe

Types of carbon markets

Compliance market

- EU ETS: forest carbon is not included
- California ETS: domestic and international forest carbon credits included (but only from specific areas)
- NZ ETS: only domestic forest carbon credits included
- Brazil ETS: domestic forest carbon credits likely to be included

Voluntary market ('over-the-counter')

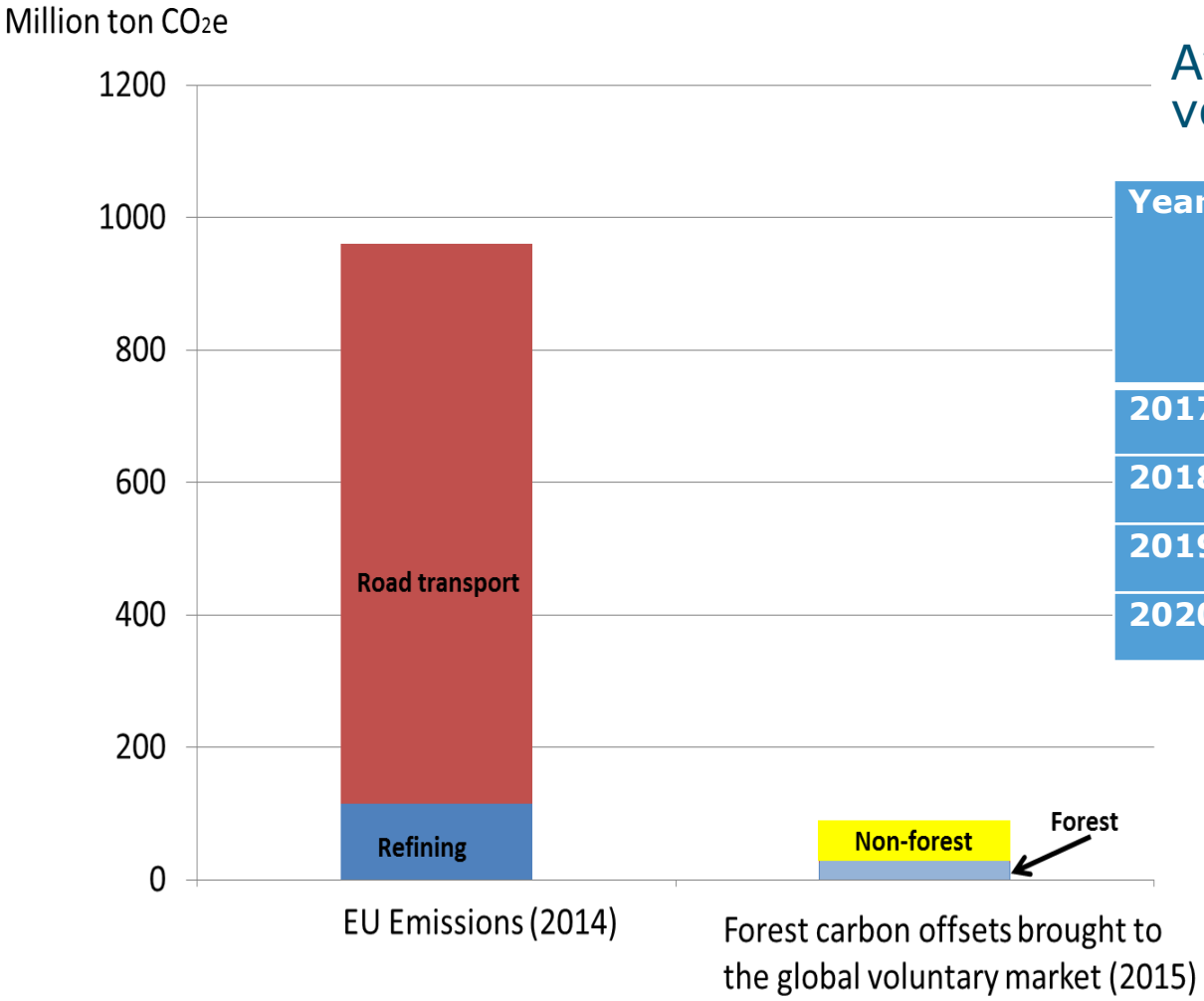
- Buyers: companies and retailers
- Suppliers: wide variety of project developers sometimes with NGO involvement
- Majority of forest credits from the tropics

The voluntary carbon market (2015)

Category	Physical volume (Mton CO_2e)	Monetary volume (million US$)	Price level (US$/ton CO_2e)
Forest carbon, of which:	26	120	4.5
- REDD+	*20*	*65*	3.3
- Tree planting	*5*	*40*	7.5
- Improved forest management	*1*	*14*	9.6
Non-forest carbon, of which:	58	158	
- Wind energy	*22*	*42*	1.9
- Landfill methane	*14*	*27*	2
- Others	*22*	*88*	4.9
Total	**84**	**278**	

The voluntary carbon market

Size of annual carbon market turn-over versus annual emissions



Availability of credits in the voluntary market - estimate

Year	Forest carbon credits	Other carbon credits
2017	15-25	50-70
2018	15-30	50-100
2019	20-35	50-150
2020	20-100	50-200

Certification of carbon credits

Certification of (forest) carbon credits

- Voluntary Carbon Standard (VCS): 55% market share, includes REDD and peat projects
- For forest carbon projects, VCS can be combined with the Climate Community Biodiversity (CCB) standard
- Gold Standard (NGO-supported)
- Plan Vivo (Smallholders)
- American Carbon Registry (ACR)

Registries for carbon credits

- APX VCS Registry
- Markit Registry
- American Carbon Registry

Institutional context: **Paris Agreement**

- Limit the global temperature increase compared to pre-industrial to well below 2 ^{o}C.
- Countries need to report on their targets and progress.
- Forests are recognised as carbon sinks (but not peat) “parties should take action to conserve and enhance” such sinks.
- The agreement recognizes the potential role for voluntary international collaboration; mechanisms to facilitate such collaboration (and ensure transparent reporting on carbon benefits) are to be developed.

Recent Developments: the EU policy setting

The EU Carbon Emission Trading Scheme (ETS)

- Covers emissions from refining but not from road transport. Emissions from air transport within the EEA are included.
- Using carbon offsets from forest carbon is not allowed.
- Ongoing discussions on ETS beyond 2020.

The EU 'Effort Sharing Regulation' (ESR)

- Mandatory emission reduction targets for member states, also covers emissions from road transport.
- Latest proposals allow using forest carbon offsets, with an EU maximum of around 200 million ton CO_2. Member states need to ensure permanence and additionality of offsets.
- Current focus is on domestic forest carbon offsets.

The Carbon Neutral Now Initiative

- Climate Neutral Now is an initiative of the United Nations Climate Change secretariat.
- Involves the 'Climate Neutral Now Pledge': (i) measure greenhouse gas emissions; (ii) reduce these as much as possible; (iii) report greenhouse gas emissions; and (iv) compensate those which cannot be avoided - with UN certified emission reductions.
- To date, Microsoft, Adidas, Sony and M&S participate in this initiative.
- CNN is based upon Kyoto Protocol's Clean Development Mechanism (CDM) and credits are generated based on existing projects
- Additionality is a concern.

The Carbon Offsetting and Reduction Scheme for International Aviation (CORSAIR) initiative

- Aviation accounts for some 2% of global CO_2 emissions (of which international: 1.3%).
- The sector expressed the “aspirational goal” of keeping the global net CO_2 emissions from international aviation from 2020 at the same level ("carbon neutral growth from 2020").
- In addition to ongoing efficiency improvement, the sector would use carbon offsets. Currently, the offset mechanism is being designed. CDM/CNN credits may be included.
- International Civil Aviation Organization (ICAO) estimates that this will generate an annual offset demand between 288 $MtCO_2e$ and 376 $MtCO_2e$ by 2030.

Options for the refining and road transport sectors: criteria

Technical Criteria

- Additionality : carbon gains can be attributed to the project
- Leakage : no relocation of emissions to other areas
- Permanence : carbon should be stored long-term
- Local social impacts : benefit sharing with local communities

Operational criteria

- Match with EU policy environment
- Availability (2017 and beyond)
- Costs
- Verification mechanism (VCS+CCB, Gold Standard, others)
- Social acceptability (sensitivities apply)

Considerations in defining options (1)

- Focus on forest carbon credits (availability, additionality, costs, co-benefits).
- The availability of forest carbon credits in the voluntary market is currently ~25 million ton CO_2 per year. However few carbon credits are from the EU.
- The availability can be ramped up in the time frame of several years (working with specialised companies); peat projects can increase supply of credits to over 100 million ton CO_2 per year.

Considerations in defining options (2)

- Costs of (forest) carbon offsets are very low compared to other options to reduce emissions in refining and road transport (forest carbon: between 3.5 to 10 US$/ton CO_2).
- Timing: the current carbon market is a buyers' market. However, this may change rapidly, in particular because of CORSAIR.
- Communication (policy makers, the public, NGOs) & transparency are key in order to gain buy-in for a carbon strategy.
- The selection of projects is important, even for certified projects

Investing in carbon credits (1)

Pilot offsetting emissions in the refining sector

- Carbon emissions from refining covered under the ETS.
- Refineries need to obtain emission allowances, either through free allocation or (increasingly) by purchasing them.
- Forest carbon credits and other credits generated on the voluntary market are not currently recognised in the ETS.
- The Paris Agreement offers scope to use international (forest) carbon credits for domestic purposes. However it will take several years before mechanisms to support such transfers are established.

➢ Limited short term opportunities for the refining sector

Investing in carbon credits (2)

Zero Carbon Petrol and Diesel

- Offer green 'carbon neutral' petrol and diesel to consumers at retail stations.
- In principle, lower net carbon emissions than electric vehicles (and no adverse impacts related to batteries)
- The costs per litre range from 1.5 to 3 eurocent

	Costs of carbon credits			
Costs of carbon offsets (€ per litre)	@ 5 euro / ton CO2		@ 10 euro / ton CO2	
	Diesel	Petrol	Diesel	Petrol
Well-to Tank	0.003	0.002	0.006	0.005
Tank-to-Wheel	0.012	0.013	0.024	0.025
Well-to-Wheel	0.015	0.015	0.030	0.030

Investing in carbon credits (3)

Zero Carbon Petrol and Diesel (continued)

- Supply chain implications are limited: no need for separate supply chain to the retail station (based on matching principle as with green electricity)
- Important: communications and NGO engagement, transparency, ensure that BAT is used, ensure credible verification mechanism, show co-benefits (e.g. biodiversity).
- Scalable option: can be tested with small-scale pilot in a specific country.
- These credits may not count towards the ESR – which may enhance their appeal to consumers (based on additionality)

Zero-carbon petrol – availability of credits

Year	Indicative availability of forest carbon credits (million ton CO_2 credits)	Litres of fuel for which emissions can be offset with forest carbon credits (million litres)	Total offsetting costs - @7.5 euro ton CO_2) (million euro)
2017	20	6 640	166
2018	25	8 300	207
2019	30	9 960	249
2020	50	16 600	415
Post 2020	>100	> 33 200	

Conclusions

- Forest carbon credits are cheap compared to emission reduction options available in refineries
- There is a large reservoir of such credits, only a small part of that is currently tapped in the voluntary carbon market (and an even smaller share in compliance markets, i.e. in California and New Zealand)
- The EU regulatory environment offers limited possibilities to use carbon credits at present (but it is still evolving)
- One potentially appealing option is to develop and market a 'carbon neutral fuel'
- The costs of offsetting WTW emissions from petrol or diesel fuel are only 1.5 to 3 eurocents per litre
- Such a product would offer an environmental friendly and easy-to-use alternative for electric driving

For discussion

Carbon-neutral petrol and diesel at the pump in 2018?

- Rationale
- Technical feasibility
- Economics
- Marketability

(How) can the product be piloted?