International Conference «The European Forest-Based Sector: Bio-Responses to Address New Climate and Energy Challenges?»
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Theme 1: Forests as carbon sinks

Policies and measures of carbon sequestration in the voluntary market: which equilibrium between transaction costs and shared rules of good practices?

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Outline

- Forestry potential mitigation and use of carbon sinks in the EU
  - EU-ETS and extra EU developments
- Characters of forestry-based carbon offset investments and markets
  - Voluntary investments
- Types of standards and shared rules of good practices
- Final remarks

Mitigation options in the forest sector

- Maintaining or increasing the forest area through reducing deforestation and establishing new forest stands
- Maintaining or increasing C density through forest management
- Increasing off-site C stocks in wood products
- Fossil fuel substitution (Bioenergy / biofuels)

Reducing Deforestation should be the dominant option

Table 7.1. *The global carbon budget (GtC yr⁻¹); errors represent ±1 standard deviation uncertainty estimates and not interannual variability, which is larger. The atmospheric increase (first line) results from fluxes to and from the atmosphere: positive fluxes are inputs to the atmosphere (emissions); negative fluxes are losses from the atmosphere (sinks); and numbers in parentheses are ranges. Note that the total sink of anthropogenic CO_2 is well constrained. Thus, the ocean-to-atmosphere and land-to-atmosphere fluxes are negatively correlated: if one is larger, the other must be smaller to match the total sink, and vice versa.*

	1980s		1990s		2000–2005c
	TAR	TAR revised[a]	TAR	AR4	AR4
Atmospheric Increase[b]	3.3 ± 0.1	3.3 ± 0.1	3.2 ± 0.1	3.2 ± 0.1	4.1 ± 0.1
Emissions (fossil + cement)[c]	5.4 ± 0.3	5.4 ± 0.3	6.4 ± 0.4	6.4 ± 0.4	7.2 ± 0.3
Net ocean-to-atmosphere flux[d]	−1.9 ± 0.6	−1.8 ± 0.8	−1.7 ± 0.5	−2.2 ± 0.4	−2.2 ± 0.5
Net land-to-atmosphere flux[e]	−0.2 ± 0.7	−0.3 ± 0.9	−1.4 ± 0.7	−1.0 ± 0.6	−0.9 ± 0.6
Partitioned as follows					
Land use change flux	1.7 (0.6 to 2.5)	1.4 (0.4 to 2.3)	n.a.	1.6 (0.5 to 2.7)	n.a.
Residual terrestrial sink	−1.9 (−3.8 to −0.3)	−1.7 (−3.4 to 0.2)	n.a.	−2.6 (−4.3 to −0.9)	n.a.

Notes:

Forestry (excluding bioenergy): Economic Mitigation Potential, at US$ 100 / tCO2, by 2030. (IPCC FAR, Vol III, Chapter 9, 2007)

$MtCO_2$

	Regional estimates (bottom-up models)			Global mean
	Mean	Low	High	
OECD countries	*700*	420	980	2,730
EIT	*150*	90	210	3,600
non-OECD countries	*1,900*	760	3.040	7,445
Global	*2,750*	1,270	4,230	13,775

The IPPC FAR estimates (conservatively) a global forestry mitigation potential (including bio-energy) of about 3,140 $MtCO_2$ y^{-1}

In Europe: "... achievable sink of 90 to 180 $MtCO_2$ y^{-1} was estimated" for 2040

LULUCF and the Kyoto Protocol

- Art. 3.3 activities (mandatory)
  - -Afforestation, reforestation (gross-net accounting)
  - -Deforestation
- Art 3.4 activities (voluntary)
  - -Revegetation (*net-net accounting, no cap*)
  - -Cropland and grazing land management (*net-net accounting*, *no cap*)
  - -Forest management (*gross-net accounting*, *discount*, *cap*)
- Artt. 6 and 12: project-based mechanisms (only AR, up to 1% of the BY emissions)

Table 1 – Summary of LULUCF activities in the first Commitment Period of the Kyoto Protocol

Initial land use	Final land use		
	Forest	Cropland	Grazing land
Forest	FM	D	D
Cropland	AR	CM	GM
Grazing land	AR	CM	GM

The activities shown in italics in the table are also eligible as CDM projects, undertaken in developing countries. For reasons discussed below, the most significant omission in the CDM is the ineligibility of a reduction in deforestation, which could be quantitatively more important than the activities that are eligible.

Schlamadinger *et al.*, ES&P, 2007

EU-15 and EU-27: GHG emissions trends and target for the 2008–2012 period

Paesi	Emisssioni al 1990	Emissioni al 2006	Variazione (Emisisoni al 2005 / Emissioni 2006)	Variazione (Emisisoni 2006 / Emissioni 1990)	EU burden-sharing (Kyoto target)		Gap (2006 – Kyoto target) senza i meccanismi flessibili e LULUCF	
	Mt CO_2-eq	Mt CO_2-eq	%	%	%	Mt CO_2-eq	%	Mt CO_2-eq
EU-15	4 265.5	4 151.1	-0.8	-2.7	-8.0	3.924.3	+ 5.3 / + 1.0	226,8
EU-27	5 572.2	5 142.8	-0.3	-7.7	No target	No target	No target	No target

"Although most EU-15 Member States intend to use carbon sinks to achieve their Kyoto targets, the projected total amount of CO2 to be removed between 2008 and 2012 is relatively small and will amount to 57.5 Mt CO2 per year for EU-15 Member States, a reduction of 1.35% from EU-15 base-year emissions. This is 50% more than what was projected in 2007" (EEA, 2008).

Country	Effect of additional measures		Use of carbon sinks [3]		Use of Kyoto mechanisms [3]		Projections for 2010 with all measures, use of carbon sinks and Kyoto mechanisms		Gap between projections and target [1, 2, 4]	
	Mt CO_2-eq.	% of base year	Mt CO_2-eq.	% of base year	Mt CO_2-eq.	% of base year	Mt CO_2-eq.	% of base year	Mt CO_2-eq.	% of base year
Austria	-14.6	-18.4	0.0	0.0	-9.0	-11.4	69.3	-12.4	0.5	1
Belgium	0.0	0.0	0.0	0.0	-7.0	-4.8	133.3	-8.5	-1.5	-1
Denmark	0.0	0.0	-2.3	-3.3	-4.2	-6.1	61.3	-11.6	6.5	9
Finland	-12.4	-17.4	-0.6	-0.8	-1.4	-2.0	70.6	-0.6	-0.4	-1
France	-24.0	-4.3	-4.1	-0.7	0.0	0.0	540.2	-4.2	-23.7	-4
Germany	-40.8	-3.3	-4.5	-0.4	0.0	0.0	907.1	-26.4	-66.6	-5
Greece	-2.1	-2.0	-1.2	-1.1	0.0	0.0	129.3	20.8	-4.5	-4
Ireland	-0.1	-0.2	-2.1	-3.7	-3.6	-6.5	62.5	12.4	-0.3	-1
Italy	-17.3	-3.3	-25.3	-4.9	-20.7	-4.0	491.4	-4.9	8.1	2
Luxembourg	-0.1	-1.1	0.0	0.0	-4.0	-30.0	9.5	-27.9	0.0	0
Netherlands	0.0	0.0	-0.1	-0.1	-13.0	-6.1	193.9	-9.0	-6.4	-3
Portugal	-2.4	-4.0	-4.7	-7.7	-5.8	-9.6	73.8	22.7	-2.6	-4
Spain	-27.6	-9.5	-5.8	-2.0	-57.8	-19.9	346.1	19.4	12.9	4
Sweden	0.0	0.0	-2.1	-3.0	0.0	0.0	68.0	-5.7	-7.0	-10
United Kingdom	0.0	0.0	-4.0	-0.5	0.0	0.0	621.3	-20.0	-58.0	-7
EU-15	-141.3	-3.3	-56.8	-1.3	-126.5	-3.0	3.778	-11.4	-147	-3.4
EU-27 [5]	-172.7	-3.1 [5]	No target	No target	No target	No target	5 008.8 [5]	-10.1 [5]	No target	No target
Norway	0.0	0.0	0.0	0.0	0.0	0.0	57.3	15.4	7.1	14
Switzerland	-0.8	-1.5	0.0	0.0	-1.4	-2.7	48.9	-7.4	0.3	1

Financial value of *carbon sink* in EU-15 according to different C credit prices

Mt CO_2				M Euros $year^{-1}$		
A/R (A)	FM (B)	B*0,15 (C)	Total (A+C)	5 Euro * t^{-1}	20 Euro * t^{-1}	50 Euro * t^{-1}
32.2	171.3	25.7	57.5	288.0	1150.0	2880.0

The EU and Forestry in Climate Agreements – An historical (and up-to-date) complicated relationship

- Primary objective of EU climate policy: reduction of GHG emissions from industry and energy
- Biological (but not geological) sequestration is considered a distraction from this effort (monitoring, reporting, verification and liability, non-permanence, leakage, …) ► biological sequestration excluded from EU ETS ("[…] except for CERs and ERUs from land use, land use change and forestry activities")
- The EC decided (October 2008) not to include REDD credits in the EU–ETS ("allowing companies to buy REDD credits would result in serious imbalances between supply and demand in the scheme. There are also unresolved monitoring, reporting, verification and liability questions. Forestry credits are temporary" .. and do not "guarantee environmental integrity" (COM(2008) 645/3)

Voluntary investments

Individuals, group of citizens, public entities, enterprises (theclimategroup.org, USA), …, have decided to invest, on voluntary basis, for cut back on their emissions

Investments directly oriented to the activities of the investors organization
"carbon emission offset" investments (windmills, biological sequestration, …)

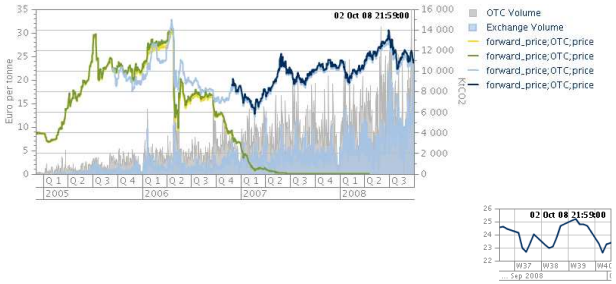
Transaction Volumes and Values, 2006 and 2007[1]

Markets	Volume ($MtCO_2e$)		Value (US$million)	
	2006	2007	2006	2007
Voluntary OTC Market	14.3	42.1	58.5	258.4
CCX	10.3	22.9	38.3	72.4
Total Voluntary Markets	**24.6**	**65.0**	**96.7**	**330.8**
EU ETS	1,1044	2,061	24,436	50,097
Primary CDM	537	551	6,887	6,887
Secondary CDM	25	240	8,384	8,384
Joint Implementation	16	41	141	495
New South Wales	20	25	225	224
Total Regulated Markets	**1,702**	**2,918**	**40,072**	**66,087**
Total Global Market	**1,727**	**2,983**	**40,169**	**66,417**

Source: Ecosystem Marketplace, New Carbon Finance, World Bank

APAT

EUA - Spot price trend



La conservazione delle risorse fitogenetiche in Italia: le attività dell'Agenzia per la protezione dell'ambiente e per i servizi tecnici
Dott. Andrea Todisco

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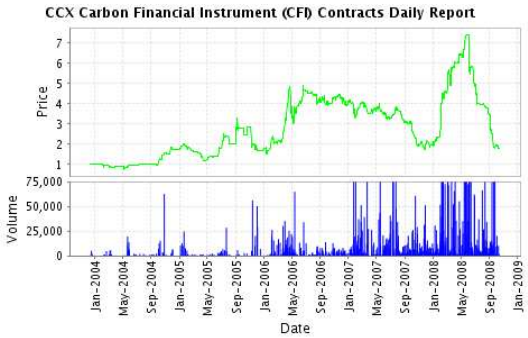
Price and volume (US$) of VERs in the *Chicago Climate Exchange*. (http://www.chicagoclimatex.com/market/data/summary.jsf)

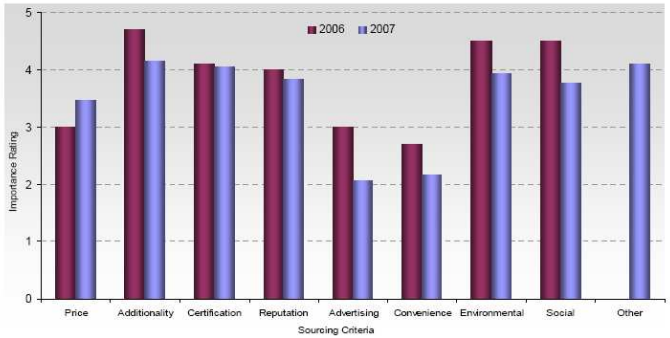


"Biodiversità, agricoltura, aree protette e paesaggi rurali. Il trattato FAO per la conservazione delle risorse fitogenetiche in Italia"
Giornata di Studio, Arancera, Orto Botanico, Roma, 18 luglio 2008

Customer Motivations: Going Green or Making Green?

- **Corporate responsibility / environmental ethics**
- **Public relations / branding**
- **Reduction of energy consumptions**
- **Sales of carbon neutral products**
- **Seller advertising / green marketing (like Ecolabel, FSC, …)**
- **Anticipation of regulation (e.g., for development of REDD C credits)**
- **Agenda 21 or Energy plans for local communities and municipalities**
- **Climate change-influenced business model (such as re-insurance agencies or ski-companies)**
- **Investment**
- **….**

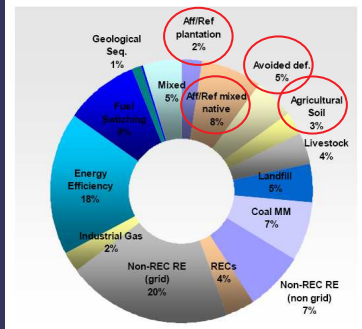
Figure 34: What Buyers Look for When Buying Offsets (seller responses), 2006 and 2007 [111]



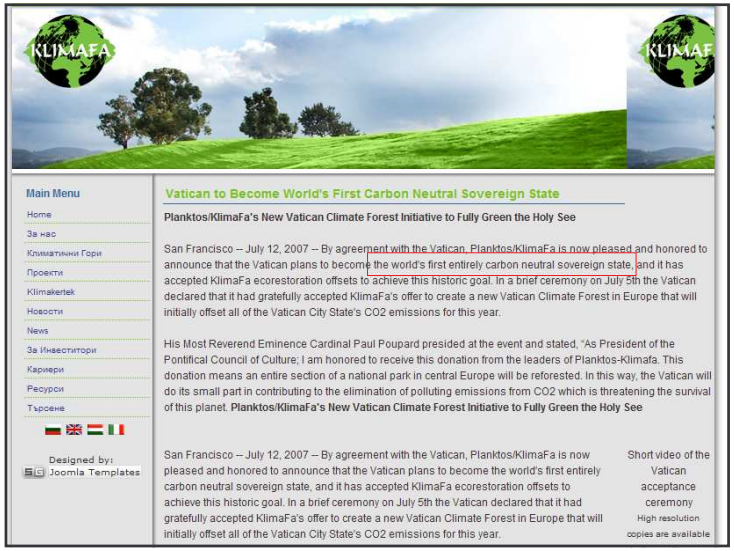
Source: Ecosystem Marketplace, New Carbon Finance

Sources of offset credits in the voluntary markets

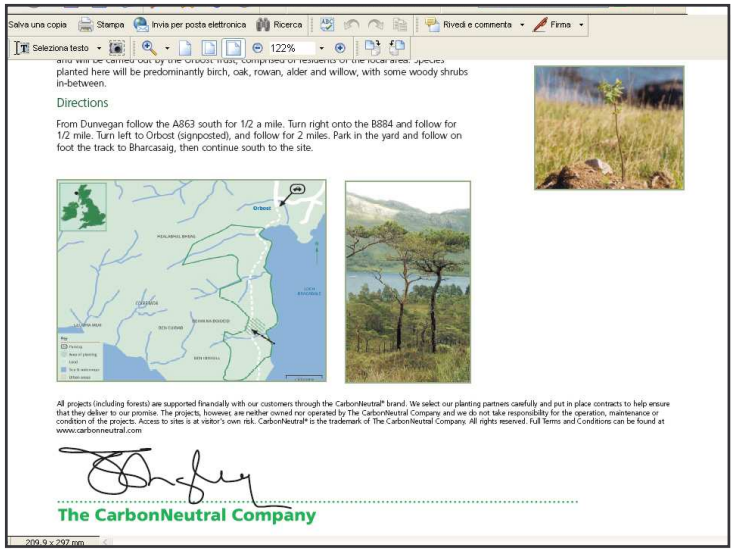
Transaction Volume by Project Type, OTC 2007



Source: Ecosystem Marketplace, New Carbon Finance



Student thesis
Emissions = 0.920 tCO2
Offset by a forest plantation of 0,12 ha
Investment cost = 60 Euros
65 Euros per tC02
505 Euros/ha of plantation



Types of forest-based C offset investments

1. **Conversion of cropland, grazing land and other land to forests**
   - **commercial forest (at harvesting, carbon sequestered in WFP is deemed to be emitted)**
   - **agro-forestry,**
   - **pure conservation planting projects with the intention that such a forest would never be harvested (no revenue will be received from WPs, the only revenue will be from the sale of the carbon credits)**
2. **Forest management aimed at maximising C in living and dead biomass, and soil**
3. **Activities intended at reducing deforestation and forest degradation (such as fire prevention, reducing pest and disease attacks and damages, …)**
4. **Installation of biomass plants, having substitution effects on fossil fuels**
5. **Long-lived wood products, providing benefits by displacing fossil-fuel intensive construction materials**

Development of forest-based investments for carbon markets has many positive aspects

- active role of civil society
- more flexibility and wider array of investments
- the leading position played by the forest sector
- the implementation of new areas of investments (e.g. transactions connected with reduced degradation, avoided deforestation or carbon sequestration in wood products)
- setting the stage for future developments in the regulated markets

Concerns about forest-based offset credits transacted on the voluntary carbon markets

- Additionality
- Non-permanence
- Leakage
- Potential negative impacts of climate change on forest ecosystems (may be stronger than previously projected and positive impacts are being overestimated)
- High transaction costs
- Technical complexities related to monitoring and reporting, especially when compared to the M&R of emissions from the installations of other sectors
- Large-scale forestry project are preferred (scale economy) at the expenses of micro, small and medium-scaled projects (less than 1,000 ha) -- usually with diffuse, positive environmental and social effects
- Unequal distribution of benefits (small money for forest owners and managers and generous money for "coyotes")

Certification Costs

Each project validation and the subsequent verifications with the CCBS are estimated to range between 5 000 and 40 000 US$. The CFS charges 1 500 € (2 050 US$[5]) for validation, 0.50 € (0.68 US$) for each *sold* CO_2 certificate, and estimates each verification procedure to cost between 8 000 and 15 000 € (10 900 - 20 500 US$). CFS / CCBS combined certification is estimated to cost 10 000 - 20 000 € (13 700 - 27 400 US$). Plan Vivo validation costs between 5 000 and 12 500 US$ and the Foundation charges 0.30 US$ for each *sold* CO_2 certificate. Each verification procedure is forecast to cost between 15 000 and 30 000 US$. The VCS validation and verification is estimated not to remarkably differ from other standards, ranging between 15 000 and 30 000 US$ for each third party audit. A further 0.04 US$ for each CO_2 certificate must be paid directly *after* issuance.

Eduard Merger, 2008

It is a question of standards?

- Forestry carbon standards in the voluntary carbon market vary significantly, in terms of eligibility, additionality, quantification of C credits & monitoring, permanence, socio-economic & environmental benefits, quality of certification, costs & fees of certification
- 50 percent of forest-based offset credits transacted on the voluntary carbon markets are based on "independent" standards (Bayon et al., 2008)
- Frequently standards applied are generic and do not have procedures for a rigorous monitoring and reporting

Recently

- Plan Vivo Systems and Standard
- Voluntary Carbon Standard AFOLU (VCS)
- Climate, Community and Biodiversity Standard (CCBS)
- CarbonFix Standard (CFS)

have produced specific standards for forest-based C offset investments

Final remarks

- The development of forestry-based C offset investments has had positive aspects, also in terms of re-organisation of the forest sector
- They keep operational the principle “provider gets”, symmetrical to the principle “polluter pays”
- The flow of environmental benefits (water management, erosion control, biodiversity and landscape, etc.) connected to forestry-based carbon investments may turn them to be cost-effective and, from a “public” perspective, C sequestration may be at zero cost
- The process of verification and certification need transparency and clarity
- Equilibrium between large scaled and small scaled projects and transaction costs and guarantees