The cost efficiency of offsetting through the Clean Development Mechanism.

7 December 2009.

CARBON RETIREMENT

Responsible Carbon Neutrality

Contents.

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Introduction.

This research examines the overall efficiency of carbon offsetting with Certified Emission Reductions (CERs), the carbon credits that developed countries are allowed to use to offset some of their emissions under the Kyoto Protocol. It shows that for every £10 a buyer spends with a carbon offsetting retailer using CERs, £2.76 typically goes to setting up and running the project.

CDM projects do not work in a standard way. Different organisations are involved in each case and the economics of each project is different. Therefore it may be unlikely that the general model and results shown in this report represent a particular project. The purpose of this research is to provide the first indication of the efficiency of the overall market in terms of channeling money into environmental projects.

2

Methodology.

Identify organisations involved in the supply chain

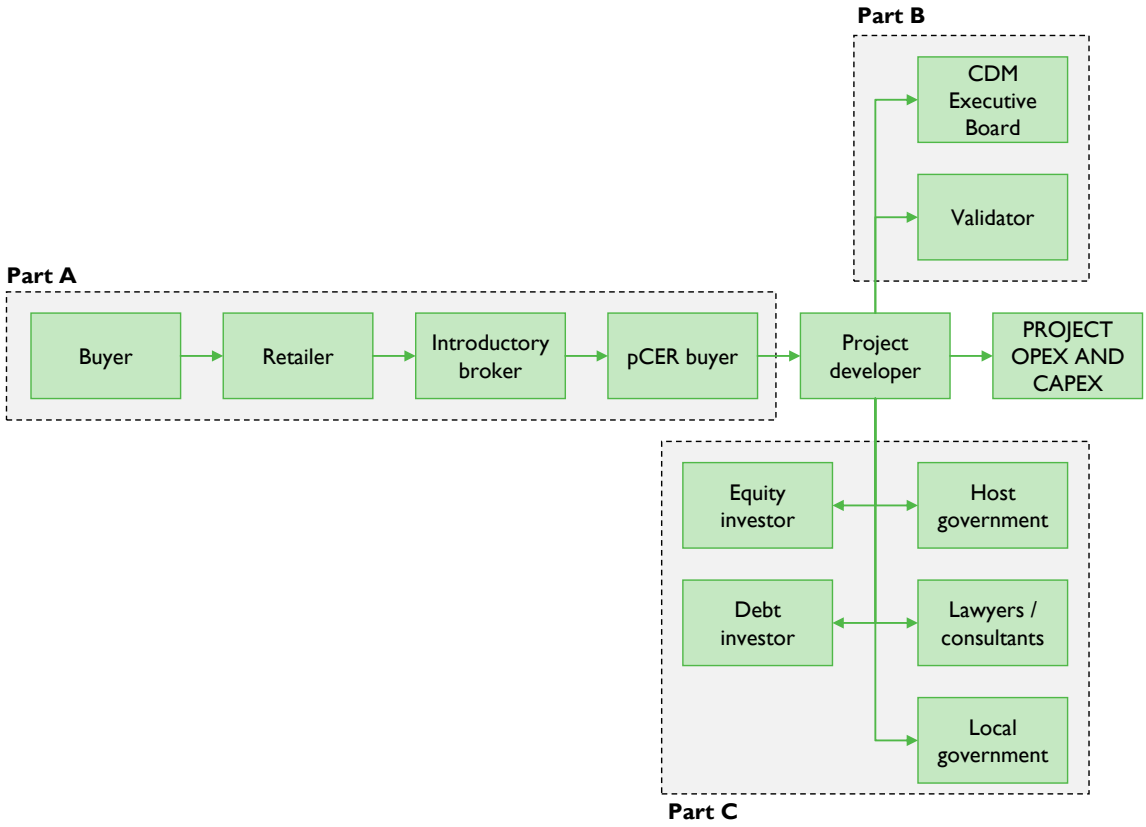
The CDM market works differently in different countries, for different project types and for different project developers. The market model used in this research, therefore, does not represent a single model of CER delivery, but shows typical organisations in the supply chain. The following key actors were identified through desk research and discussions with industry experts:

Actor	Role
Buyer	The end buyer of the carbon offsetting service. This party may not ever own the credits – they may remain with the retailer.
Retailer	Markets the offsetting service and retires credits.

Introductory broker	Finds buyers for 'delivered' CERs (secondary CERs or sCERs), which originate from projects that have been registered by the CDM executive board and verified by official auditors.
Primary CER buyer	Buys credits that are not yet delivered (primary CERs or pCERs) and takes on the risk that the project may fail to deliver sCERs.
Project developer	Manages and implements the offsetting project.
Investor	Provides up-front equity funding for the project developer.
Bank	Provides debt funding for the project developer.
Consultants & lawyers	Prepare project documentation and legal agreements.
Validator	Checks that the project is accurately described by the project documentation (one-off).
Verifier	Verifies that emission reductions are occurring (annual).
Host government	Approves the project and levies corporation tax on the project developer's profits.
Local government	Levies local taxes on the project developer.
CDM Executive Board	UN body that registers projects and charges adaptation fee.

Break into three sections

The supply chain for carbon offsets was broken into three stages: (A) brokering and retailing, (B) post-implementation and (C) pre-implementation. These stages are shown in the following diagram.



Costs in Part A – brokering and retailing

The price paid by the buyer to the retailer is the average price of five UK retailers of CER-based carbon offsetting, excluding VAT, as published on their websites on 24 September 2009.

Company	Credit type	Price per tonne inc VAT	Price per tonne ex VAT @ 15%
Clear	CER	£14.99	£13.03
Carbon Footprint	CER	£15.00	£13.04
Carbon Passport	CER	£15.20	£13.22
Pure	CER	£16.73	£14.55
BA	CER	£16.97	£14.75
Average			**£13.72**

The price paid by the pCER buyer to the project developer is taken from the project-level analysis (outlined in Appendix 1).

The prices paid by the retailer and introductory broker for the credits are less transparent. We have assumed that the introductory broker pays the price of sCERs to the pCER buyer. sCER price data was downloaded from the European Climate Exchange[1], and the average price in GBP for the December 2009 contract between 14 March 2008 and 19 September 2009[2] was calculated to be £12.37. The introductory broker was assumed to charge a 1% fee[3], so the retailer was assumed to pay sCER + 1%.

Costs in part B – post-implementation

There are two main costs that the project developer has to pay before selling CERs – the adaptation fee and verification of emission reductions. The adaptation fee of 2% is a charge from the CDM Executive Board that goes into a fund for climate change adaptation projects in poor countries.

Verification happens each year and determines how many CERs the project can sell. These costs tend to be similar for all CDM projects. We drew on two existing research reports into CDM fixed costs from the UNDP[4] and Pusat Tenega Malaysia[5]. These fixed costs were applied to the CER revenue of a sample of ten CDM projects. Appendix 2 shows this analysis, and that verification costs are typically 4% of CER revenue over the life of a project.

[1] http://www.ecx.eu/ECX-Historical-Data

[2] Using currency data from OAndA: http://www.oanda.com/convert/fxhistory. This research used data between 1 January 2008 and 19 September 2009; ECX did not have sCER price data before 14 March 2008.

[3] Based on discussions with industry experts.

[4] http://www.undp.org/energy/docs/cdmchapter5.pdf, 2003

[5] http://cdm.eib.org.my/useful_materials/Presentation/2.%20Transaction%20Costs%20%20CDM%20%20Fui%20Pin.pdf, 2005

The adaptation fee and verification costs are applied directly to the CER price (i.e. the cost of the adaptation fee was calculated at 2% of the price paid of the credits sold by the project developer, and the verification costs at 4% of this price).

Costs in part C - pre-implementation

At this stage, the efficiency of the project as a whole was considered; because many CDM projects are primarily designed to generate commercial revenue, for example through selling electricity (Appendix 1 shows that typically only 14% of total project revenue is represented by sale of CERs). The project's capital investment and maintenance are therefore likely to be much larger than the CER revenue.

We therefore analysed project expenditure over the anticipated life of the project to understand what proportion of the total revenue (including commercial sales and CER sales) was spent in six categories: local taxes and insurance, project operating costs, depreciation (representing capital expenditure), bank interest, corporation tax and profit.

10 CDM projects that supplied sufficient financial data in the business cases submitted to the CDM Executive Board were chosen at random. This analysis is summarised in Appendix 1, which shows that in this sample typically 50% of the project developers' revenue is accounted for by capital expenditure and project operating costs.

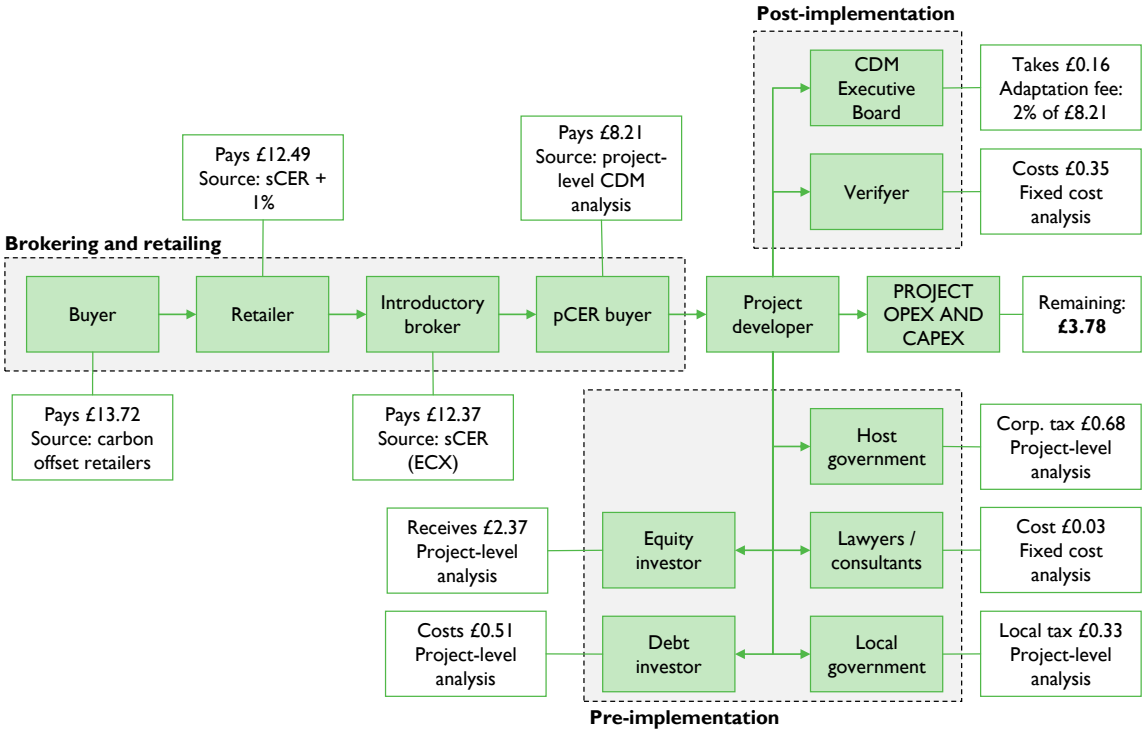
Validation of methodology and results with industry experts

We validated the above methodology and below results with industry experts at project developer and pCER buyer stages of the process.

3

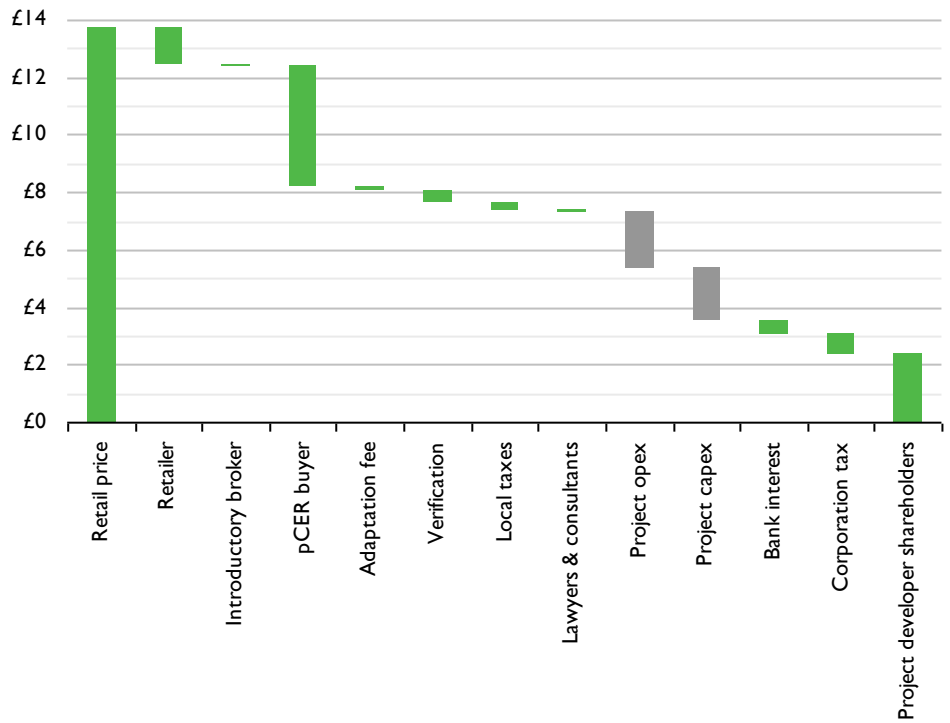
Results.

The diagram on the next page summarises the results from this research. It indicates that of the £13.72 spent by the buyer, typically £3.78 (or 27.6%) remains for capital expenditure and project maintenance.



The cuts taken at each stage are represented in the waterfall chart below.

The breakdown of costs across the carbon offsetting supply chain for offsetting one tonne of greenhouse gas emissions with CDM credits (project expenditure is highlighted in grey).



The 'pCER buyer' takes the largest cut in the process, representing 30% of the end buyer's money. This is because the pCER buyer in the market model used here takes most of the risk that the project is not accepted by the CDM Executive Board. Some

pCERs will not be registered and verified and become sCERs, so the pCER buyer pays a discount against the market sCER price.

Appendices.

Appendix 1: summary of project-level financial analysis

This appendix summarises the project-level analysis of CDM projects. Projects were chosen randomly from those registered between 1 January 2008 and 19 September 2009 and had sufficient financial data in their business case. The information was accessed from the UNFCCC website[6] on 19 September 2009. All figures are shown in USD unless otherwise labeled, with currency conversion rates at the project registration date from OAndA[7]. The projects were analysed from an income and expenditure point of view over their whole project life, which ranged from 15-30 years. All projects below happen to be from India or China. On 16 October 2009 these countries represented 59% of CDM projects. Some projects from other countries were not suitable for this exercise because they were small and had not submitted detailed financial information.

						Percentages show the cost as a proportion of total revenue					
Project number	**Project type**	**Registration date**	**Total revenue**	**Sale price per CER[8] (GBP)**	**% of revenue generated by CERs**	**Local taxes and insurance**	**Project operating costs**	**Depreciation**	**Bank interest**	**Corporation tax**	**Profit after tax**
1709	Waste heat recovery	15/12/2008	90.1m	7.79	16%	1.1m 1.2%	35.8m 40%	24.7m 27%	2.7m 3%	8.5m 9%	17.3m 19%
1907	Waste heat recovery	19/11/2008	12.7m	10.95	18%	0.4m 3%	2.0m 16%	2.2m 18%	0.5m 4%	2.6m 20%	5.0m 39%
1304	Natural gas	22/02/2008	2,560m[9]	6.43	6%	40m 2%	1,650m 64%	331m 13%	98m 4%	94m 4%	346m 14%
1530	Biomass	17/04/2008	75.0m	6.45	4%	7.4m	50.1m	7.0m	3.2m	1.1m	6.2m

[6] http://cdm.unfccc.int/
[7] http://www.oanda.com/convert/fxhistory
[8] See known weakness #5 in Appendix 3.
[9] This project appears to be exceptionally large – possibly by a factor of 10. Any error of magnitude does not affect the proportion of costs in each category.

						10%	67%	9%	4%	1%	8%
1808	Hydro	10/10/2008	46.2m	6.81	10%	2.4m	4.9m	8.2m	3.2m	6.7m	20.1m
						5%	11%	18%	7%	14%	45%
1992	Wind	26/01/2009	97.3m	7.53	16%	7.5m	13.6m	26.9m	2.6m	6.8m	38.3m
						9%	14%	28%	3%	7%	39%
1980	Hydro	24/03/2009	147.2m	12.11	14%	10.7m	15.1m	34.6m	3.2m	12.7m	70.8m
						7%	10%	24%	2%	9%	48%
1763	Hydro	08/08/2008	26.3m	5.14	19%	0.1m	2.3m	7.0m	1.3m	3.2m	12.5m
						0.4%	9%	26%	5%	12%	47%
1823	Wind	10/10/2008	198.2m	6.02	14%	1.2m	31.7m	73.6m	36.9m	6.4m	48.5m
						1%	16%	37%	19%	3%	24%
1566	Hydro	03/06/2009	6.6m	12.95	18%	0.3m	1.1m	2.1m	1.1m	0.6m	1.5m
						5%	16%	31%	16%	9%	23%
ARITHMETIC MEAN				**8.21**	**14%**	**4%**	**26%**	**23%**	**7%**	**9%**	**31%**

Appendix 2: summary of fixed CDM costs analysis

This appendix summarises the analysis of fixed CDM costs. It draws on two existing research reports, from UNDP (2003)[10] and Pusat Tenega Malaysia (2005)[11]. The fixed costs identified in these reports were applied to the random sample of ten projects (explained in Appendix 1) to understand the relative scale of the costs. Where the UNDP/PST reports gave ranges, a mid-point was used. Pre-implementation costs are assumed to be a sub-set of project operating expenses in the project-level calculations. All figures are in USD and exchange rates at the project registration date were used.

The UNDP research looks at five areas of pre-implementation cost: feasibility assessment (typically 12.5k), PDD preparation (32.5k), registration (10k), validation (12.5k) and legal work (22.5k), totalling 90k. Annual monitoring and verification was typically 9k.

The Pusat Tenega Malaysia research identifies seven areas of pre-implementation cost: project assessment (9k), PDD preparation (37.5k), new baseline methodology (7.5k), validation (15k), host country approval (1.5k), legal costs (27.5k) and registration fees (20k), totalling 118k. Annual verification was typically 9.5k.

Averaging the two pieces of research shows that monitoring and verification fixed costs are typically 4.3% of CER revenue, while pre-implementation fixed costs are typically 0.35% of total project revenue.

Project number	Total revenue	CER revenue	Length of project (years)	UNDP Total pre-imp costs	As % of total revenue	UNDP Monitoring and verification	As % of CER revenue	PST Total pre-imp costs	As % of total revenue	PST Monitoring and verification	As % of CER revenue
1709	90.1m	14.1m	15	90k	0.1%	135k	1.0%	118k	0.1%	143k	1.0%
1907	12.7m	2.3m	20	90k	0.7%	180k	7.7%	118k	0.9%	190k	8.2%
1304	2,560m	160.1m	20	90k	0.0%	180k	0.1%	118k	0.0%	190k	0.1%
1530	75.0m	3.2m	20	90k	0.1%	180k	5.7%	118k	0.2%	190k	6.0%
1808	46.2m	4.7m	20	90k	0.2%	180k	3.8%	118k	0.3%	190k	4.0%
1992	97.3m	15.7m	25	90k	0.1%	225k	1.4%	118k	0.1%	238k	1.5%
1980	147.2m	20.5m	30	90k	0.1%	270k	1.3%	118k	0.1%	285k	1.4%
1763	26.3m	4.9m	25	90k	0.3%	225k	4.6%	118k	0.4%	238k	4.8%
1823	198.2m	27.1m	21	90k	0.0%	189k	0.7%	118k	0.1%	200k	0.7%
1566	6.6m	1.2m	20	90k	1.4%	180k	15.2%	118k	1.8%	190k	16.1%
ARITHMETIC MEAN					**0.3%**		**4.2%**		**0.4%**		**4.4%**

[10] http://www.undp.org/energy/docs/cdmchapter5.pdf,

[11] http://cdm.eib.org.my/useful_materials/Presentation/2.%20Transaction%20Costs%20%20CDM%20%20Fui%20Pin.pdf

Appendix 3: known limitations

1. The project-level analysis was based on a small sample of ten CDM projects. Unsurprisingly, the distribution of costs in these projects shows quite significant variation, suggesting that a larger sample could give more accurate data. However, we are confident that the averages given in Appendix 1 represent a reasonable reflection of CDM projects.

2. For some projects, CER revenue was not included in the income and expenditure data, and was instead dealt with separately. For this purposes of this research, we added the CER revenue into the income and expenditure data, but were unable to adjust corporation tax accordingly.

3. Parts A and B of the methodology (brokering and retailing; and post-implementation costs) take a different approach to Part C (pre-implementation costs). In Part C, the project costs are usually far larger than the CDM revenue, because the ten projects on average earn only 14% of their revenue from sale of CERs. Therefore the project costs have been analysed as a proportion of total revenue – including commercial revenue (such as sale of electricity), to get an understanding of overall project efficiency (i.e. for each dollar you put in, how much is spent on the project?).

4. There is a lack of transparency in Part A and the prices paid by brokers are based on simple assumptions. However, the project level analysis gives us an indication of the price paid by the pCER buyer (GBP 8.21), and this corresponds reasonably to typical pCER prices during the period under review (1 January 2008 to 19 September 2009). Therefore the relative cuts of the buyer's money taken by actors in Part A could vary, but should not impact the numbers further down the supply chain (at the project developer end of the process).

5. Two or three of the projects in the project-level analysis appear to be modelled on sale of sCERs rather than pCERs, because the price per CER is high. However, the market model used in this research assumes that the project developer sells pCERs to a broker. This discrepancy means that the average pCER price of £8.21 is likely to be slightly overstated, which will in turn overstate the overall market efficiency shown by this research.

6. The economics of CDM projects vary significantly and it is therefore likely that this research will not reflect a particular project. However, the purpose of the research is to give an indication of the efficiency of the market as a whole.

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