UNEP Risø Climate Working Paper Series
No.1
June 2012

PENNY WISE, POUND FOOLISH?

IS THE ORIGINAL INTENTION OF COST EFFICIENT EMISSIONS REDUCTION THROUGH THE CDM BEING FULFILLED?

Søren E. Lütken
Low Carbon Development Programme
URC

UNEP RISØ CENTRE

ENERGY, CLIMATE AND SUSTAINABLE DEVELOPMENT

PENNY WISE, POUND FOOLISH?

IS THE ORIGINAL INTENTION OF COST EFFICIENT EMISSIONS REDUCTION THROUGH THE CDM BEING FULFILLED?

Content

Søren E. Lütken is a senior advisor at Risoe, DTU in Denmark and the author of Corporate Strategies and the Clean Development Mechanism (Edward Elgar © 2008). Prior to this, he has worked in Beijing for nearly five years, partly as administrator of the Danish Government's climate change programme with China, partly as private adviser to public and private entities in the Chinese climate business. He has a PhD in climate policy with particular focus on the Clean Development Mechanism.

e-mail: snlu@risoe.dtu.dk

Summary

The CDM is promoted as a mechanism that brings into play cheaper emissions reduction options in developing countries compared to those that can be realized in developed countries. The wide array of emissions reduction options that are actually exploited simultaneously may not be compatible with this assumption, and data is now accruing that challenges the cost efficiency of emissions reduction options exploited. While CDM has indeed activated probably the most cost efficient and hence very profitable emissions reductions in industrial gasses, the most prevalent investments in CDM are very cost in*efficient reductions in wind and hydro projects.*

In most cases, the marginal cost of abatement is not an investment driver, and it is therefore mistaken to include such projects that emerge from other investment motives in a global reduction response model the purpose of which is cost efficiency. Developing country investors are by far the largest investor group in CDM, and while many have invested in very profitable and dedicated (one-revenue stream) emissions reduction projects, the majority has its investment capital at stake in very unprofitable projects – from a carbon revenue perspective.

It is therefore time to rethink the approach to promoting emissions reduction in developing countries with a view to bringing them in better alignment with reductions undertaken in developed countries – or to realize that while the CDM promotes emissions reduction in developing countries, it does not reduce the global cost of reduction. It only shifts the burden of investment.

Introduction

When the Clean Development Mechanism, or CDM, was originally drafted as a mechanism to facilitate greenhouse gas emissions reduction under the Kyoto Protocol, it was the inherent assumption and indeed a driving force for its creation that it would promote a cost efficient global response to climate change. Giving developed countries access to meeting their quantitative emissions reduction targets on a project basis in developing countries was thought to be cheaper – the marginal cost of abatement lower – simply due to an assumed less efficient energy sector or, alternatively, other sectors in which emissions could be reduced at a lower price than would be the case in developed countries.

This assumption is supported by a number of studies of Marginal Abatement Costs (MAC) (Global ETSAP-TIAM model and calculation method of marginal abatement cost curves (MACC)[1] or an OECD comparison of different models for the reduction of global costs of abatement[2]), which are used as a point of departure for estimating ranges of emission reduction costs, including options with even negative costs. McKinsey's model is the increasingly prevailing graphical representation of the spread and reach of emission reduction options in a given economy, see Figure 1 as an example. The McKinsey model does not necessarily estimate the most cost efficient reduction options across economies.

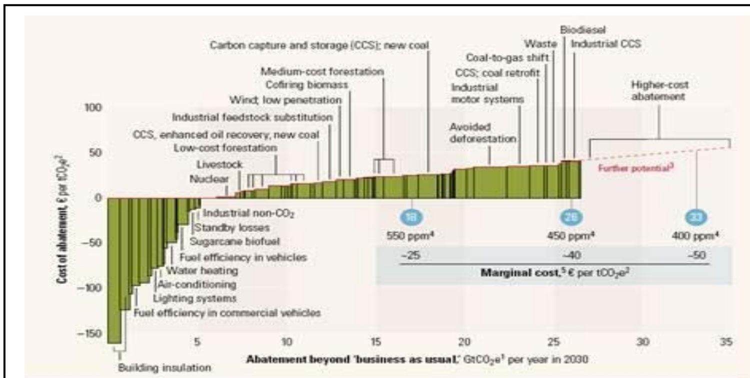

Figure 1. A McKinsey Marginal Abatement Cost illustration

But earlier, General Computable Equilibrium (GCE) models were widespread in the modelling of post-Kyoto architectures, distributing the necessary global reduction effort according to national cost curves and adding factors meant to reflect inertia in cross-border investment transactions. These 'inertia factors' were thought to reflect that while

[1] Uwe Remme, Markus Blesl, Institute of Energy Economics and the Rational Use of Energy, Universität Stuttgart, 2007
[2] http://www.oecd.org/dataoecd/58/50/29173911.pdf

being cost efficient in emissions reduction terms, other factors could influence the attractiveness of investment options, thus leaving some of the cost-efficient reduction option unexploited.

Already in the 1980s the obviously profitable, but unexploited energy efficiency investments were subject to financial innovation through the Energy Service Company (ESCO) concept that would make marginal investments in one corporation the core business of another. It has obvious parallels to outsourcing of peripheral processes to facilitate the focusing on core competencies, also investment wise. The basis for the ESCO is the outsourcing of the energy supply – a function that is rarely aligned with the core competencies of a corporation. Electricity is just supposed to be there when equipment is plugged in. If an ESCO takes over the service and makes it its core competency to deliver the energy as efficiently as possible, it will also devote the necessary finance to do so.

The GACMO model work in the 1990s, as one example, addressed those barriers that prevent obviously profitable investments in energy efficiency in materializing through assumptions on scarcity of capital. For example it uses, in the case of India, it uses a coefficient for capital, materials and equipment of 1.4 to reflect that 'capital is 40% more costly than its market price would suggest, so that when estimating the cost of the project the capital value should be increased by that amount.'[3] For the model result, this factor would partly reflect the inertia in investment willingness, but it applies indiscriminately across sectors and therefore does not reflect the fundamental investment drivers. It only results in 'inertia'.

It would therefore not be entirely unexpected if the global effort would turn out not to be entirely optimized in terms of reduction costs, though the primary driving force for projects developed under the Clean Development Mechanism would – or should, according to the additionality requirement – remain the value of the 'carbon asset'. This

[3] http://uneprisoe.org/EconomicsGHG/MethGuidelines.pdf, p. 38

value would be realized through a carbon market producing a value for the Certified Emissions Reductions, the CERs, in an equilibrium between supply and demand.

It seems, however, that the power of the reduction cost may be over estimated. Lütken & Michaelowa (2008) argue at length that the emissions reduction objective plays a secondary role in investment decisions among Annex-I corporations with an emission reduction obligation. The fact that CDM investments have occurred anyway is due to the – initially unexpected – circumstance that *non*-Annex-I investors seem to have adopted the mechanism to a significant extent.

There is little research into non-Annex-I CDM investors' motivations – probably because the CDM philosophy and indeed the prime litmus test for the eligibility of a CDM project is its additionality. Implicitly, all registered projects have been endorsed by both designated operational entities (DOEs) and the Executive Board for the CDM as emissions reduction activities and their motivation has therefore been officially established. Any probe into possible other motivations would In any case face the obstacle that any response to the contrary would contradict what has already been argued for the project's approval.

With that in mind the logical assumption would be that the emissions reduction comes at an attractive price, i.e. that the marginal abatement cost is relatively low. However, given the identity of the typical investor, i.e. a non-Annex-I investor, the concept of a 'cost of abatement' is not appropriate. Non-Annex-I investors do not have a (marginal) cost of abatement – they pursue a marginal abatement revenue. This revenue is calculated on the basis of the offer in the carbon market most often brought to the seller by brokers. These prices have changed over time, but they normally do not reflect different reduction costs; rather they reflect the market price as benchmarked among the brokers – which again is generally benchmarked against the EU ETS. The market price – while representing a uniform reduction cost for the buyers of the CERs – is concealing a widely differing 'cost' of abatement. Or rather a significant spread in the profits earned by the project developers. These profits do not challenge the cost efficiency of the actual investment in emissions reduction terms. In fact on the contrary. The larger the profit, the smaller the cost of abatement.

These profits are yields on investments undertaken by developing country investors – yields that some find unacceptably high[4] – but it is unthinkable that developing country developers with no emissions reduction obligation would throw their capital at unprofitable reduction options with little yield on investments. Or that's the theory, at least.

Calculating the Actual Financial Contribution

The CDM Pipeline[5] publishes the size of the investment undertaken for each CDM project as it is stated in the PDD. The investments are generally not verified, though in many cases validators have actually requested copies of invoices or quotations for equipment or construction work to verify the developer's claims in terms of the size of investments. The size of the investment, of course, is crucial for the calculation for the IRR, which remains the prevailing additionality argument. With data accruing from a sizeable number of CDM projects that have issued CERs, and for which also the investment has been published, the financial contribution from CDM in different types of projects can now be calculated on the basis of assumptions about the price of CERs. The projects that have issued CERs are those that have been published for public comments in the years 2004-2008. The relevant carbon price would be the primary market contract price in this period, with significant emphasis on the Chinese prices, as the Chinese projects make up 619 out of the 984 projects for which there is data (as of January 2012). In this period prices were generally lower than 2008-2010 prices. The Chinese DNA set a floor price late 2006 of 7€ (corresponding to about 10 US$) and already in 2007 raised this to 8€ – and 10.5€ for wind energy projects[6]. 213 of the 619 Chinese projects are wind energy projects[7].

[4] reference is made to the general and long standing NGO campaign against industrial gasses projects and the European Commission's decision to ban HFC23 projects from Eu ETS after 2012

[5] http://cdmpipeline.org/publications/CDMpipeline.xlsx

[6] To some extent, in fact, the Chinese authorities with these floor prices reflected the difference in reduction costs (as Figure 2 illustrates) by requiring higher carbon prices for the least attractive investments in emissions reduction terms. This information is per personal on location experience from the Chinese carbon market. Figures are not published by the Chinese authorities.

[7] all data extracted from the UNEP Risoe CDMpipeline.org in January 2012

If, on this background, a uniform global market price for primary CERs[8] is set at 12 US$/CER, the carbon related returns on investments can be calculated. While there is a risk of overestimating this return by using 12 US$, and while there would be particular merit in differentiating the carbon prices among host countries (and the Chinese wind projects), there is no immediate access to information for the individual projects that would make such an approach possible. It could also be argued that the crash of the carbon prices over 2011 merits a value considerably lower than the 12 US$, but here, again, the Chinese DNAs practice of not allowing flexible prices in ERPAs for Chinese projects, and the earlier practice of not allowing unilateral projects (here understood as projects without ERPAs at the time of DNA approval) is an argument against reducing the figure to a lower value.

The 984 projects in the CDMpipeline provide a reasonable statistical background for evaluating the importance of the financial contribution from the CERs, though further stratification in the following reduces the statistical solidity. Nevertheless, results are instructive. The financial contribution can be distributed geographically, i.e. a country's average return on the investment in reduction terms, or it can be distributed on technologies.

National distribution

Not all countries have the same options for emissions reduction available for their local investors and developers to exploit. Some countries are wind prone, others are mountainous with hydro power options and still others have large industries with options for energy efficiency improvements. Only the seven countries listed in Table 1 have sufficient projects (here set at 10 recorded projects) to serve as a basis for calculating an average return on CDM investments in emissions reduction terms. In Table 1 the averages have been weighted. That means that the return on a single investment is related to the national investment and the national return. For example, if a project returns 5% and represents 25% of the national investment in CDM assets, it weighs 1.25%-points in the national return on CDM investments.

[8] This assumption may be disputed for projects that are exposed to price risks through Emissions Reduction Purchase Agreements with flexible prices, or projects with no ERPAs signed (unilateral projects), which is often the case for Indian projects. Most projects, however, including practically all Chinese projects, have been traded on fixed-price ERPAs

	weighted percentage	weighted percentage excl. industrial gasses
Brazil	194,8	148,6
Chile	45,4	33,4
China	439,0	3,1
India	51,1	9,7
Malaysia	15,1	15,1
Mexico	171,9	70,9
South Korea	1342,6	2,8

Table 1. Annual carbon revenue as percentage of investment

Column 1 in Table 1 illustrates the weighted return on all projects (for which there is data), but only for the carbon related revenues. Hence, other revenue streams, typically sales of power, are not included. The returns are quite significant, but in most cases (with the exception of Malaysia) they are strongly influenced by the very high profits on the industrial gasses projects. Column 2 excludes these projects and thus reveals a significantly lower weighted return on the national CDM pools of projects.

The spread among countries is remarkably high and does not immediately support the assumption that the most cost efficient emissions reduction options are exploited first. While it could be argued that Latin America was early in embarking on the CDM, the first mover was actually India, which has a relatively low return on its CDM portfolio compared to particularly the Latin American countries. It could also be argued that not all countries have equally attractive reduction options, but the fact that they develop CDM projects anyway is thus only supporting the claim that CDM does not ensure cost efficient emissions reduction[9].

[9] In this regard the ‘equitable access to CDM’ as documented in ‘Indexing CDM Distribution - Leveling the Playing Field’, S. Lütken, UNEP Risoe Center 2011, is a contradiction in terms, as exactly these national differences would

With the exemptions of China and South Korea, however, the carbon returns are generally attractive if observed on an average national level, even without the industrial gasses projects, and it seems reasonable to claim that these reductions compete well with reduction options in developed countries. But looking at the distribution among different technologies things still do not add up.

determine the attractiveness in terms of cost efficiency of reduction investments – and thus also the flow of investments. This is obviously not the case.

Distribution on Technologies

Ten technologies are presented in Figure 2. Together they represent 924 projects or 93% of all projects for which there is data. Here, the population of each given type of project is distributed according to the annual financial contribution from CERs as a percentage of the investment sum. For example, the light blue line represents wind energy projects. Reading the X-axis (see the red dots in Figure 2) the annual investment contribution ranges between 0 and 1 percent, which according to the Y-axis reading is true for 12% of the total population of wind energy projects. This means that the 12% least performing wind energy projects return between zero and one percent

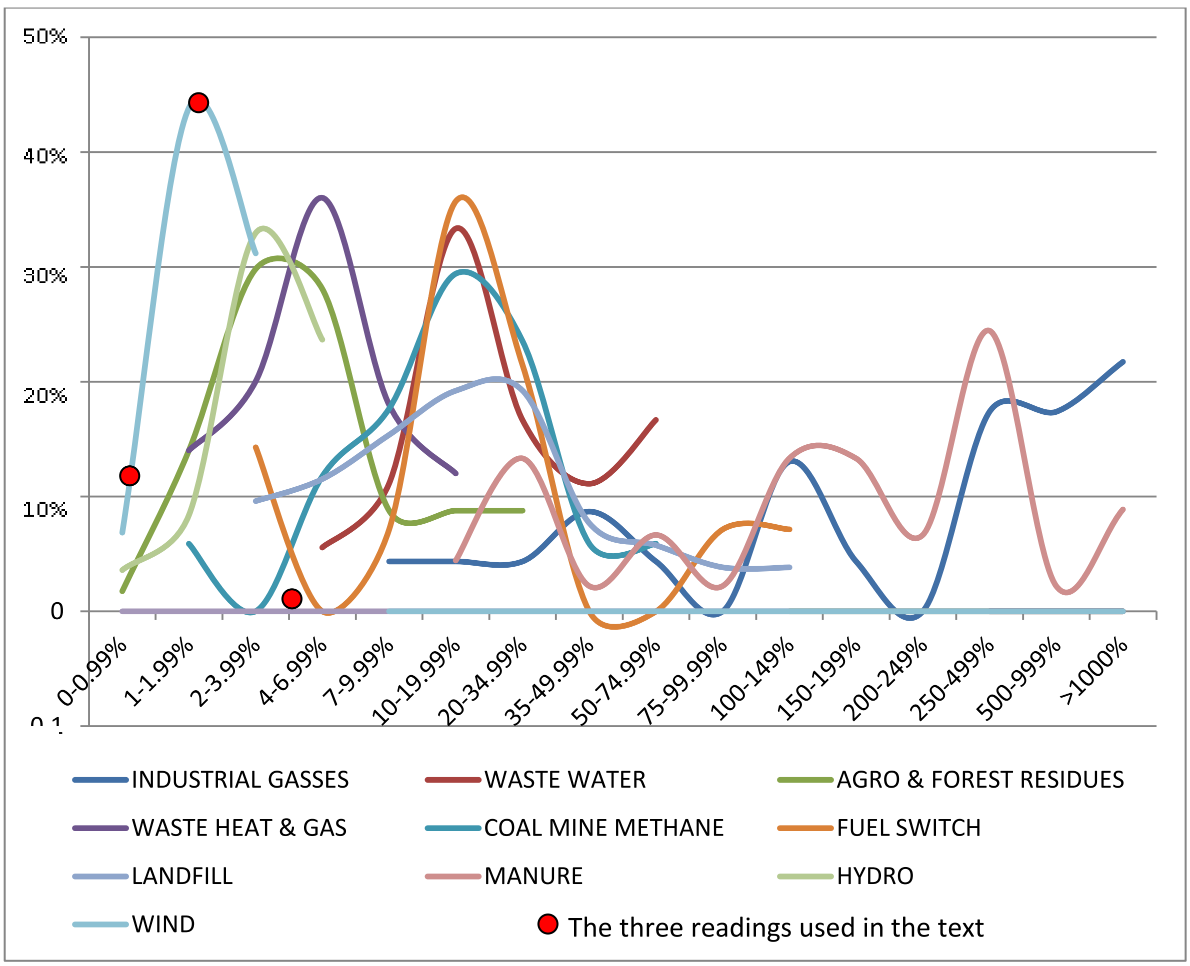

FIGURE 2. Annual Carbon returns on investment

annually of the investment sum in the form of carbon revenue. 45% of wind energy projects return between 1 and 2% of the investment annually in the form of carbon revenue. And finally at 4-7% annual carbon return only one project in the population is left. Wind energy projects reveal themselves as the least attractive emissions reduction response out of the 10 technologies presented, closely followed by hydro projects (the light green line).

It should not be expected that these two project categories, wind and hydro, being the most expensive reduction options, are also the most prevalent in the statistics and those that by far have attracted the most investment capital. The unfortunate conclusion for these two project categories is that not only are these the most expensive reduction options available in CDM host countries (among those technologies for which there is sufficient data); the financial contribution from carbon revenues is also in all likelihood insufficient to be a decisive driver in the investment decision.

The latter conclusion may be debatable and should be seen in comparison to the dominant revenue stream in these projects, i.e. in most cases the sales of power. For some of the technologies, particularly hydro and wind, the calculation of these revenues is straightforward if the feed-in tariff is known. The CDM Pipeline does not record these values, but they can be extracted from the PDDs. Chinese feed-in tariffs in the period (Chinese projects make up 80% of all wind and hydro projects in the statistics) have been recorded in the range between 9 and 13 UScents/kWh for wind projects and a bit less for hydro projects. If an average of 11 UScents is used, the revenue per MWh is 110 USD. Correspondingly, the Chinese grid emission factor is about 1.0 tCO2e/MWh resulting in a carbon revenue of 12 USD/MWh. The carbon revenue therefore makes up just around 10% of the total revenue in these projects.

The limited contribution from carbon revenues may also be attributed to particularly low issuance successes. If the project performs worse than expected, the revenues will of course be lower, while the upfront investment cost remains constant. With a fixed relation between power production and emissions reduction, a low performance compared to the investment cost is a 'double whammy' as both carbon revenues and power revenues suffer. The average issuance success of Chinese hydro power projects is 82% and wind projects 92% (similar to the global averages as recorded in the CDMpipeline). Expectations at the time of investment have therefore been higher than recorded performance – for some of the projects maybe even fatally – but it does not change the ratio between the carbon and the power revenues.

Technology	observations	lowest value	highest value	median
Industrial gasses	22	7,96%	1719,03%	304,97%
Manure	45	5,44%	1162,88%	169,90%
Fuel switch	14	2,60%	579,56%	19,62%
Waste water	18	0,16%	71,19%	17,65%
Landfill	52	0,90%	162,72%	14,18%
Coal mine methane	17	1,12%	58,95%	13,10%
Waste heat & gas	50	1,04%	18,04%	5,08%
Agro & forest residues	57	0,55%	34,17%	4,30%
Hydro	334	0,02%	41,30%	3,50%
Wind	292	0,03%	5,24%	1,84%

Table 2. Annual carbon returns on investments

For other categories, such calculations are more complex and require more information. Agro and forest residues are also power production projects, sometimes including heat supply, and approximations here could be an option, though it is not as straightforward as wind and hydro. Waste gas and heat are also often power production projects and also here displacement of fossil fuel is a good approximation of additional revenue streams from power supply, when the grid emission factor is known. Coal mine methane is equally possible to calculate on a basis of the GWP of methane and the estimated power supply, but not all coal mine methane projects are power producing in which case the CERs become the only revenue stream.

The variance in carbon revenues relative to the investment *within* the categories is also a source of concern if the assumption is that the carbon price promotes the development of the most cost efficient emissions reduction projects (see Table 2 as well as Figure 1 for the span of returns). While wind energy projects in that comparison are remarkably constant in their low performance, practically all other technologies show astonishingly high variability in carbon returns. Even within the same technology there is therefore nothing that points to the exploitation of the most cost efficient reduction options. Projects that return 1% are developed at the same time as project that return 100%. Also for these projects the widely varying returns could be related to particularly low performance of the projects compared to expectations. Take landfill gas projects for example. The ten best performing projects in terms of investment contribution have an average issuance success of 84%, while the ten least performing have an average issuance percentage of 27% - a difference of a factor 3. But the average carbon revenues of the ten least successful projects is 3.8%, while the ten best performing projects on average return 86% of the investment capital in carbon revenues per year – a difference of a factor 22. Hence, while there is a natural correlation between issuance success and economic performance, it is far from explaining why projects with widely differing performance, and hence cost efficiency of emissions reduction, are occurring at the same time.

Are the projects really occurring exactly at the same time? Looking at the same 20 landfill gas projects again there is no difference in date of initiation at all, if anything a marginally later initiation of the more cost efficient options – which might be attributed to a learning curve.

A valid argument following the earlier example, however, could be that not all developers face the same abatement costs for the same project. They may have differing access to finance, which would mean that the operational costs differ. This may explain part of the variability of carbon returns on the investments – simply because they are more profitable for other reasons than the low carbon revenue. For instance, if (again) a Chinese project developer, most of which are state owned entities, is borrowing at 4%, while a private investor in Brazil in borrowing at 15% they do not face identical abatement costs for identical projects – and they do not require the same carbon return to make the same profit. In this way, profitable emissions reduction could just as well be determined by differences in interest rates! To address this issue, differences in national returns per technology may be analysed, though data sets become very small. 7 Brazilian landfill gas projects return between 20.7 and 133.3 per cent per year of the investment; 8 Chilean projects return between 3.5 and 59.9 per cent and 13 Chinese projects return between 4.7 and 39.1 percent. The idea is not to compare the countries – technologies employed differ: all Chinese projects are power projects (imposed by law) with additional revenues from power, while all Chilean projects are flaring projects without any additional revenue. The numbers illustrate, however, that even within national borders projects perform with widely differing cost efficiency of emissions reduction. Even if compensated for difference in issuance success (all projects set at 100% issuance success) the annual carbon revenues compared to investments would still vary between 14.7 and 114.2 per cent. For the same technology. In the same country. And assuming identical performance.

While these landfill gas projects are still quite profitable in emissions reduction terms they are outpaced in an order or magnitude by the industrial gasses projects with abnormally high returns on investments. These have been under heavy shooting for years exactly due to their high profitability and few sustainable development dividends. They do, however, constitute the finest example of exploitation of low cost emissions reduction options. As many of those projects were established early on they may have been traded at lower prices than the standard 12 US$ used in these calculations; hence the returns may have been overestimated, maybe even up to a factor 50%. But even with such adjustment they represent highly profitable, and thus very cost efficient, emissions reduction projects. They do, however, suffer from the same variability in carbon returns – one project as low as 7.8% without additional revenue streams – and many of the projects are outperformed by a number of very profitable manure projects. Generally, the manure projects seem to be flying under the radar in this regard without the same criticism of the very high returns as have been the case for industrial gasses.

It should be surprising, particularly for the manure projects with such high returns, that they only make up 5% of the projects for which there is data available. Given the prevalence of manure worldwide, not least in developed countries, it could be expected that they would be much more prevalent in the statistics, including Joint Implementation statistics (where only eight manure or biogas projects are recorded).

Cash flow considerations aside (the fact that no projects regardless of technology have access to carbon finance at the time of project implementation), it seems a paradox that a mechanism the purpose of which is the exploitation of the least cost emissions reduction options in developing countries tends to prioritize very cost *in*efficient reduction options. But it is not.

Discrete Markets and Technologies

First of all, with IRRs of 1000+% the industrial gasses projects could be used as fine examples of the functioning of the Marginal Abatement Cost investment driver, even though a significant abatement profit is gained by the developers. But while it is probably correct that close to all HFC23 reduction options have been exhausted, there are significant unexploited potential in other industrial gasses like SF6, PFCs and N2O. Despite IRRs of 200+% these projects are only a trickle in the flow of CDM projects.

Wouldn't it be natural to expect that the most profitable options would be exploited first? That maybe especially manure projects that have impressive IRRs would be exhausted before investments in wind and hydro would start to emerge? Why is it that the least cost efficient reduction options are the most prevalent?

The explanation is not straight-forward, but probably composed of several factors, one of them however *not* being that all the cheaper reduction options are already exhausted.

First of all it is a relevant question if this is first and foremost due to the Chinese projects; that the Chinese drivers of development are different from what is seen in the rest of the world. That is certainly one important part of the explanation. It is an answer that does not counter the claim that emissions are not reduced in the most cost efficient way in a global perspective, but it does document a Chinese investment willingness that fundamentally disregards the cost inefficiency of emissions reduction, i.e. that investments are undertaken for other reasons and that the 'investment' in emissions reduction remains only the cost of CDM registration[10].

Another important reason for the cost inefficient emissions reduction responses may be that many of these project types are not new. They are existing technologies in which investments have been on-going for years. For hydro projects more than a century. In

[10] Corporate Strategies and the CDM – Developing country Financing for Developed Country Commitments?'S. Lütken & A. Michaelowa 2008

the case of China, more than 50,000 hydro projects have been developed since the 1980s without CDM. Only since 2005 hydro projects have become CDM responses. Hydro project development, therefore, is an on-going business and developers keep developing these projects, not as an alternative to other investment options, but because that is what they do for a living. The fact that all hydro projects are now becoming (or attempting to become) CDM projects is just a response to a new market opportunity – a market opportunity often exploited by the 'CDM sales team' – rather than reaching for a lifeline in a sector the continuation of which was in jeopardy. It was certainly not.

A third important challenge to the notion of cost efficient emissions reduction is that the choice of investment is not made by an entity having all sorts of investment options. Developers within wind invest in wind; developers of landfill gas projects invest in landfill gas. It is thought that if the carbon price is sufficiently low it would stop the wind developer investing in wind, because the landfill gas option is more profitable in emissions reduction terms. Obviously, and not surprisingly, the wind developer keeps investing in wind simply because there is no mobility between sectors. Here is also the reason for the impracticability of the – in theory very reasonable – 'incremental cost approach' that is supposed to be driving CDM. It may seem unfair to attribute the full project investment cost to emissions reduction, when for instance a wind project has obvious other purposes. But the logical question should be 'incremental to what?' As there is no mobility between the sectors, the individual investor's choice is not between a coal fired power plant and a wind turbine. It is between a wind turbine and no wind turbine. So while the cost of the coal alternative could be deducted from the wind investment it would still represent a theoretical alternative. Then, of course, is the option of having activated an entirely different set of investors by increasing the profitability of wind energy, but then we are back to having to look at the entire investment and not the (fictitious) incremental costs.

This, however, is technology dependent. While incremental costs are difficult to argue for wind and hydro, there are other technologies for which it certainly makes sense. For instance super critical coal compared to conventional coal. Or energy efficient housing compared to conventional housing. But in standalone systems, where the identity of the investor is different from whoever would be the investor in the theoretical alternative the concept of incremental costs is questionable, because the investment drivers concern the entire investment and not only a part of it.

The question comes down to the size, and predictability, of the additional revenues from carbon credits. Like the PTC in the US is decisive for the expected amount of new wind turbine installations[11], so, in theory, would a carbon price influence the interest in investing in a technology that reduces emissions. But it does not explain why investments in cost *in*efficient reduction options continue in parallel with more cost efficient options – unless the prime investment drivers for these investments are not the emissions reduction (like for most Chinese projects), while for some (but certainly not all) of the cost efficient options, the investment drivers may well be the carbon price.

So while CDM has as its purpose to promote cost efficient reduction options, it is beyond its influence to activate (most of) the cheapest options. Neither can it, apparently, deactivate the most expensive options. The natural explanation is that the identity of the investor is not trivial. Just as developed country power producers do not suddenly start to operate landfills in Vietnam; neither do developing country wind developers suddenly start to collect manure. Discreet production and technology markets produce discreet decision processes and criteria and they operate under entirely different conditions. In some sectors CDM may be a driving force; in others the CDM simply scoops up projects that happen anyway. If the latter is really the case it could correspond to 'trading in positive externalities' in some technology sectors. There are not many useful examples around to illustrate such a situation, but one may be the traditional dilemma in the biomass residues market, though not all is parallel. When for instance wheat is produced a certain amount of straw is an inevitable by-product. Often this by-product is burnt in the fields. Biomass fired power plants are utilizing the straw waste, suddenly attributing a value to the waste – so much that the use of straw shorteners is being reconsidered as the straw that it is shortening now has a value.

[11] the PTC, Production Tax Credit, practically corresponds to a feed-in tariff, which improves the profitability of wind power plants

Wheat, however, is still the core production. In many cases farmers raise the prices on the waste, because a power plant fuelled by their waste is dependent or their supplies. Should the power plant ultimately choose to get its resources from somewhere else, however, it will not lead to a halt of wheat production – it would just return things to normal.

The bottom line is that neither theory, nor observations from practical operation of the CDM confirm that the CDM promotes a cost efficient global emissions reduction response.

Penny wise, pound foolish

The profoundness of this conclusion lends itself to rethinking the idea of off-setting and the transfer of carbon credits from developing to developed countries. Or rather, it should prompt questions as to which sources of emissions reduction belong in a global offset market and which do not. For it is not a uniform picture – and it is not entirely clear when the carbon asset becomes an investment driver – and when it takes the back seat.

In Figure 3, two cut-off values have been introduced. It is thought that at 3% carbon related return on investment per year, or lower, the carbon asset cannot be an investment driver. This is probably a very conservative assumption which fully depends on the existence of other prime revenue streams. In the other end projects with 20% carbon related annual revenue, or more, are probably driven by the value of the carbon asset. The three bands (0-3%, 3-20% and 20+%) are illustrated with red for the projects that in all likelihood are not carbon driven; grey for the projects that are in a 'grey zone' where the determination of the investment driver is difficult (and therefore obvious objects for further research), and green for the projects that in all likelihood are carbon driven.

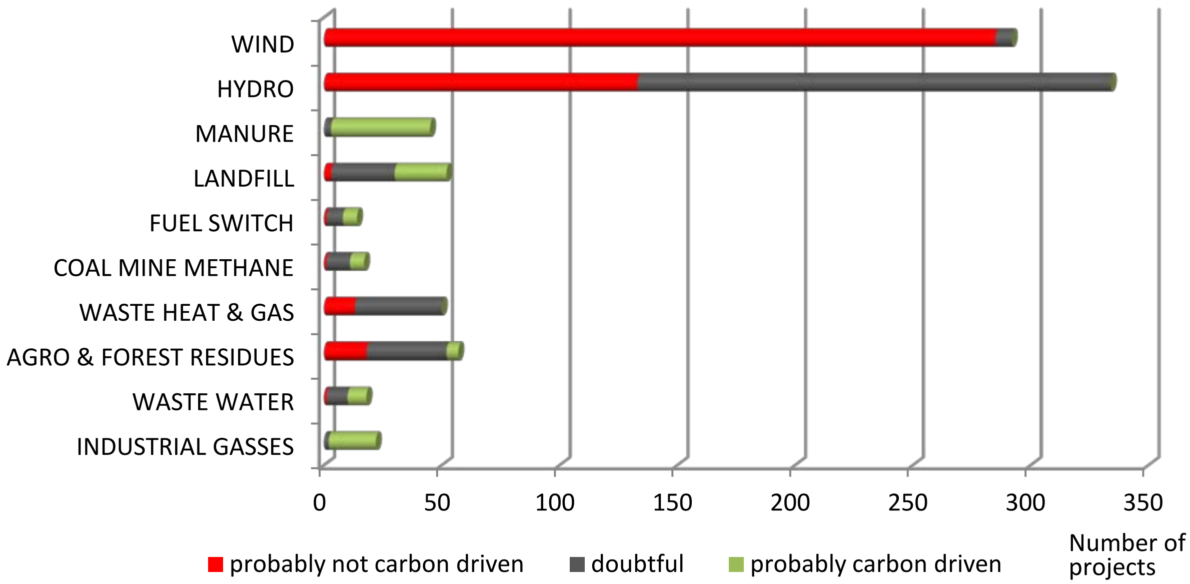

Figure 3. Carbon versus non carbon driven investments – and those in between

Obviously, the red columns reflect those investments that are cost inefficient in emissions reduction terms while the green ones are those that are probably quite efficient investment responses. The weight of the columns also gives an impression of the general prevalence of cost inefficient emissions reduction projects. Overall, 73% of the investment capital has gone into projects in the red category that return less than 3% on the investment from the carbon market annually. 26 % of the investments are in the grey category returning between 3% and 20% annually. Only 1% of investments have gone into the green category of projects that are clearly cost efficient emissions reduction activities.

These observations ought to be taken into consideration before giving in to the current push by many market actors for including a crediting mechanism in developing countries' Nationally Appropriate Mitigation Actions. The carbon price itself will not shift investments around and it will not promote the development of the most cost efficient alternatives. It must be carefully estimated for which types of activities a crediting model is suitable, if any. It should particularly be considered, if cross-sectoral carbon prices are meaningful. If one carbon price cannot discourage investment in expensive reduction options, then these investments materialize from other reasons, and the resulting credits therefore do not belong in a general global carbon market, where they ultimately may prevent the investment in very cost efficient reduction options.

UNEP Risø Centre (URC) is a leading international research and advisory institution on energy, climate and sustainable development. With a team of over 40 scientists and economists from 16 countries, URC works closely with the United Nations Environment Programme (UNEP), supporting and promoting UNEP activities in the areas of energy and climate change. The Centre is located in Denmark and is organisationally a programme at the Danish Technical University (Risø Campus).

The centre's research, policy and advisory activities are organised in three thematic programmes: Cleaner Energy Development, Low Carbon Development and Climate Resilient Development.

www.uneprisoe.org

UNEP Risø Centre on Energy, Environment and Sustainable Development (URC)
Risø Campus - Technical University of Denmark
Frederiksborgvej 399, Bldg. 142
DK-4000 Roskilde ,
Denmark