

# **Clean Development Mechanism & Emissions Trading Impacts on Carbon Sequestration Markets**

**Joel N. Gordes**  
**Environmental Energy Solutions**  
**P.O. Box 101**  
**Riverton, CT 06065**  
**(860) 379-2430**  
[jgordes@earthlink.net](mailto:jgordes@earthlink.net)  
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## Executive Summary

This investigation encompassed two primary sections which included:

- 1) An investigation into the current status of the CO<sub>2</sub> emissions market as well as projections on what value they may carry in the mid and longer term. By necessity this meant gaining a thorough understanding of the details of Joint Implementation, Clean Development Mechanism and Emissions Trading as discussed in the Kyoto Protocols and the surrounding body of literature which has grown up around it.

The Clean Development Mechanism will be the favored flexible mechanism to produce CTOs which will be sold between Annex I and non-Annex I nations. Primarily for that reason it holds greater appeal than Joint Implementation which allows activity just between Annex I nations. At this writing too many issues remain unresolved to determine if CDM will evolve into a vibrant or even workable tool capable of providing credits for an emissions trading system.

- 2) An understanding of existing sequestration programs and the detailed cost associated with them. This necessitated location of at least one cost model which could be used to determine the monetary flows in and out of a sequestration project.

Sequestration programs have gained international attention for their early recognition that carbon sequestration value can be dealt with as a commodity to partially drive host nation economies. This will, however, only occur if sinks are allowed with little restriction under the Kyoto protocols. The programs take two primary forms: 1) that of forest preservation and 2) reforestation/afforestation activities. These have varying degrees of appeal to investors but will have to compete with other practices and technologies. It also appears that under some plans, there is little discretionary funding remaining for national infrastructure building after cost for forestry activities, long term management funds and transaction costs are accounted for.

## Analysis

### “Flex Mechs” – The Driving Force

The Kyoto Protocols provide for three flexible. The “flex mechs” as they are sometimes called while welcomed by the Annex I nations have not been universally or wholeheartedly embraced by many of the G-77 due to questions of equity in emission rights and entitlements as well as other guidelines which have not yet been detailed.<sup>1</sup> These mechanisms include:

- **Joint Implementation** (Article 6 of the Kyoto Protocol) which allows joint projects between two Annex I nations providing they are in compliance with stipulations of the Protocol, generate emission reductions in excess to what would occur otherwise and must be supplemental to domestic emission reduction activities.<sup>2</sup>
- **Emissions trading** (Article 17 of the Kyoto Protocol) allows Annex B nations (those who have accepted reduction levels under the protocol) and other signatories to trade emissions to meet their commitment level under the treaty.
- **Clean Development Mechanism** (Article 12 of the Kyoto Protocol) while originally envisioned as a fund under Brazil’s proposal<sup>3</sup>, evolved into a tool which allows joint projects between Annex B nations and non-Annex B nations<sup>4</sup>. Unlike former Joint Implementation projects, Annex B nations may receive credit for such work. It is a method of being able to reduce the cost of compliance by allowing more industrialized nations to receive credits for activities undertaken in less developed nations where project costs are lower. At the same time projects must aid developing nations in meeting sustainable development goals and a meaningful way to contribute to climate change gas reductions. Projects may receive credit as early as January 1, 2000 under this mechanism.

While most of the details concerning the flex mechs are as yet unclear, CDM has what may be the most complete guidelines for implementation among the three. As “complete” as they are, they still are subject to many questions which have not been resolved at Buenos Aires as many expected they would be. It is the non-resolution of these issues which make any firm plans to proceed with projects from sequestration activities highly speculative. This is not to say it might not be profitable or worth undertaking, but the potential profit will also be attended by significant risks. The most

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<sup>1</sup> CSE Dossier. Factsheet 4. Flexible Mechanisms: Can You Sell What’s Not Yours? [www.cseindia.org](http://www.cseindia.org). p. 3-5.

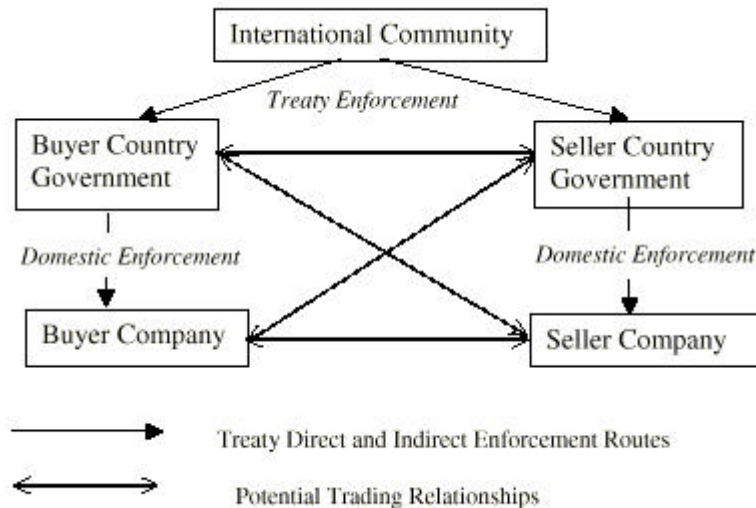
<sup>2</sup> Lisa Jacobson and Allison Schumacher, *Private Sector Perspectives on Investment in Clean Development Mechanism Projects*. Business Council for Sustainable Development. Draft of 2/17/99. P. 8.

<sup>3</sup> The fund would have been capitalized by levies being placed on industrial nations that have missed their targets as well as from investors. There is still discussion of a fund for administrative expenses as well as for aid to developing nations vulnerable to climate change such as AOSIS.

<sup>4</sup> Annex B nations are mostly Annex I nations which have undertaken obligations and are signatories to the Kyoto Protocol.

basic tenants of CDM and the unresolved questions surrounding them include but are not limited to:

- All arrangements must be of a voluntary nature and respect national sovereignty. However, the players include not just nations but private industry as well and the relationship between them for trading purposes is as depicted below:<sup>5</sup>



- Eligible projects must produce “real, measurable and long-lasting benefits” but the questions of methods and “measured by whom” are left to conjecture. What is agreed upon is that some independent entity must be established which can monitor the emission reductions or sequestration aspects of a project on a periodic basis to ensure that any resulting credits are certified as real. This requires constructing objective standards for accreditation as well as assigning legal responsibility if projects do not produce.<sup>6</sup>

One of the many trade-offs in verification will be the need to find a balance between higher transaction costs for greater accuracy versus accepting decreased accuracy through a more formulaic approach which reduces cost and bureaucratic delays.

Closely related to this is the need for an institution to be responsible for accounting for the CTOs, crediting them to a nations obligation and the initial exchanges when they are traded. Whether this is yet another entity or the same tasked with monitoring and verification is also unresolved.

- Projects must meet environmental “additionality” criteria. This means that in order for a project to qualify it must be demonstrated that the resulting greenhouse gas

<sup>5</sup> Suzi Kerr, RFF Climate Issue Brief #15, Enforcing Compliance: The Allocation of Liability in International GHG Emissions Trading and the Clean Development Mechanism, Internet edition, October 1998

<sup>6</sup> Michael Toman and Marina Cazorla, The Clean Development Mechanism: A Primer, Resources for the Future, September 1998. P. 4.

reductions are “additional” in relation to what otherwise might have occurred in the projects absence.

Closely related to this are issues of determining baselines from which to measure greenhouse gas reductions and what is termed “leakage” wherein a decrease due to a project in one area of a country leads to increases in another portion. For instance, if a forest protection project in one area to sequester carbon leads to increases logging in another area which erases the gains, the project may not qualify under the “additionality” test.<sup>7</sup> Another aspect of additionality infers that any project funds from an Annex B nation to a non-Annex B nation for CDM activities must be in addition to funds already allocated in foreign aid to that nation.<sup>8</sup>

What test will be employed for “additionality” is a major question as there is widely varied opinion on what should qualify. One industry source notes that “The general rule of thumb according to many policymakers and industry representatives is that as long as a project can beat the benchmark, the project should be considered additional.”<sup>9</sup> Another believes that additionality ought to be measured upon strict economic parameters wherein eligibility would be restricted to projects which would only be profitable with the use of certified emission reduction units (CERs<sup>10</sup>). This assumes that any project which was profitable in its own right would be undertaken anyhow and would not be additional.<sup>11</sup>

- Eligible projects must be also be what is termed “supplemental” to domestic projects by Annex B nations. “Supplementarity” has also been a key point of contention between the developed and developing nations in that the Kyoto Protocol refers to emissions trading made available through CDM as being supplemental to domestic actions. Developing nations have seen this as an important point which prohibits developed nations from shunning their responsibility to lower their own emissions at home in favor of buying their way out of their obligations. The counterpoint is that by limiting use of CDM it will raise the cost of compliance and potentially lead to the inability of developed nations to meet their reduction targets.
- The most significant questions as carbon sequestration activities are concerned are:
  - Whether carbon sequestration will even be eligible
  - If it eligible, to what degree will it be eligible
  - Will it be attractive to investors

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<sup>7</sup> op. cit. Toman and Cazorla, P. 3.

<sup>8</sup> Peter Frumhoff, Darren Goetz and Jared Hardner, Linking Solutions to Climate change and Biodiversity Loss Through the Kyoto Protocol’s Clean Development Mechanism, Union of Concerned Scientists. October 1998. P. 4, 5.

<sup>9</sup> op. cit. Jacobson and Schumacher. P. 16.

<sup>10</sup> While CERs and CTOs are used almost interchangeably, the difference is that CTO’s assume that the CERs will be tradable nationally and internationally.

<sup>11</sup> Cedric Philibert, The Clean Development Mechanism: An Economic Approach to “Environmental Additionality,” for UNEP. Nov/Dec. 1998.

The whole topic of sequestration has led to deep divisions within the environmental community as well as internationally within the G-77 and between the US and Europeans who would not count newly planted trees towards reductions. The basis for nations to undertake this activity is embodied in Article 3 of the Kyoto Protocol which provides for Land Use Change and Forestry (LUCF) but would apply only to changes in carbon resulting from active management. It also specifically covers only reforestation, afforestation and deforestation from activities undertaken from 1990 forward.<sup>12</sup> Unfortunately, the definitions of these terms is still too vague to base policy or investment upon and the final definitions will be taken up in future negotiations where some see the issue as the cause for diversion from more substantive issues.<sup>13</sup>

In general, one school of thought holds that enough is known and there is sufficient basis to use forestry practices to offset emissions. They cite scientists who say that because of the protocol's forestry plans are modest, they should be workable. Others such as Jennifer Morgan (formerly of USCAN) holds that the use of sinks is still scientifically uncertain and provides too easy an out for industrial nations to not take the tough medicine of actually reducing emissions. This is echoed by Greenpeace's Bill Hare who has "expressed doubts that Certified Tradable Offsets (CTOs) could ever be credible. Up to now, he explains, there has been no international certification system to ensure that any extra planted will remain standing."<sup>14</sup> Critics go on to cite lack of information about forest inventories, inadequate accounting methods and lack of basic scientific knowledge about how forest remove carbon as additional weaknesses of this approach.<sup>15</sup>

The general consensus appears to be that carbon sinks will be eligible in some degree but with uncertainty on any specifics. For instance, will the European or US approach to newly planted trees be accepted? Another question involves counting only biomass sequestered carbon currently while making provisions for the counting of soil sequestered carbon (which could raise the amount sequestered considerably) as the science improves to calculate this. A subtle (but the largest) uncertainty is that even if sinks are deemed eligible in determining a nation's own total emissions obligation, because CDM talks only about "clean technologies" sinks may well be ineligible and not subject to trading.

With all these uncertainties, the Intergovernmental Panel on Climate Change (IPCC) has been tasked with compiling a full report on the scientific aspects of sinks by June of 2000 including better definitions than are currently in use.

Assuming that carbon sinks will be included under CDM, there is still the question of whether they will appeal to investors compared to other carbon emission reduction alternatives. The Business Council for Sustainable Development's paper on CDM

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<sup>12</sup> Ashley Mattoon, *Bogging Down in Sinks*, Worldwatch, Nov/Dec 1998. Pp 28-36.

<sup>13</sup> Henry D. Jacoby, Ronald G. Prinn and Richard Schmalensee, *Kyoto's Unfinished Business*, Foreign Affairs, July/August 1998. P. 7.

<sup>14</sup> Costa Rica Puts a Price on CO<sub>2</sub>, Financial Times, December 3, 1997.

<sup>15</sup> Rebecca Renner, *Kyoto Protocol Carbon Targets Could be Met With "Forest Credits,"* American Chemical Society, Mar 1, 1998.

believes that activities undertaken using CDM will differ from business as usual scenarios in a number of ways:<sup>16</sup>

- Unlike most business transactions, climate change mitigation is the primary objective and while some companies may use this as a marketing or branding strategy, it is not the center of their activities. This prime objective may be a deterrent to investment by companies which are solely bottom line oriented.
- Some portion of the proceeds from CDM projects will be designated for use in developing countries which may need aid in adapting to climate change e.g. the AOSIS nations. Some potential investors will look upon this as an additional tax and calculate it into their cash flow determinations in deciding to invest or not.
- The financial instrument which will result from the projects will be Certified Emission Reduction units which are not yet directly translatable into a monetary form. Since some of the investors would require that CERs be more fully fungible, a CDM investment might not appeal.
- While CERs from CDM projects may be deemed tradable nationally and internationally, it is not yet a certainty and most companies are as yet unprepared to take advantage of it

While they state that some (mostly larger) companies will believe that CDM presents an investment opportunity, they also note that that most will still evaluate projects based upon standard business practices which are largely based upon economic factors highly weighting rate of return. Other non-economic factors will enter in if they add value in providing competitive advantage but this will vary from company to company.

What types of sequestration projects might be most attractive has also been the subject of some conjecture. One observer notes that if all forms of LUCF projects become eligible for credits under CDM and are subject to verification and certification and meet all social screens there will be two factors which will be of interest to potential investors:

- How quickly the company needs to offset its emissions liabilities
- Prospective profits or costs associated with differing project types<sup>17</sup>

They go on to say that investors with more immediate need of offsets would most likely favor projects such as forest conservation which can provide carbon credits quickly but have a higher cost and thus less (if any) profit. Even with promotion of ecotourism and allied efforts to generate revenue enhancing activities which may beat out energy sector projects, it may not compete against plantations.

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<sup>16</sup> op. cit. Jacobson and Schumacher. P. 11

<sup>17</sup> op.cit. Peter Frumhoff, DarrenGoetz and Jared Hardner, p. 7.

Less favored might those which utilize managed plantations which create carbon credits at a slower rate but may realize a net profit. This may be a reason why there has been growth in some developing countries of this activity. A major drawback is that the amount of carbon sequestered per hectare is less than in the biomass in natural forests.

While much more could be said on the appeal of sinks to potential buyers and the prospects for a vibrant market to emerge, at this point, without additional information from the upcoming IPCC report and subsequent rulings by the COP, it would be little more than conjecture. Suffice it to say, any near term plan dependent upon so many unknown variables would carry with it considerable risk.

### **Existing Program Formats: Costa Rica as a Model**

Costa Rica is the undisputed world leader in positioning itself to take advantage of flexible mechanisms which would allow them to become a net exporter of certified emission reduction units. Unlike many of the G-77, Costa Rica and several other Central and Latin American nations have embraced the CDM and trading aspects of the Kyoto Protocol not only to become “emissions entrepreneurs” but also, in the words of Jose Maria Figueres, “do our own part.”<sup>18</sup>

Indeed, a large number of the projects performed under the US Initiative on Joint Implementation (USIJI) involved that nation both in different forms of sequestration as well as renewable energy implementation. Of the first thirty-one projects accepted under USIJI in six rounds of submission, seven of these were in Costa Rica.\*

The history of this involvement began with the Arias administration which was in power from 1986 to 1990 and began preliminary studies on the potential profitability of carbon offsets. This was expanded under President Figueres (1994-1998) whose administration developed a series of initiatives aimed at nurturing this market. These included;

- Creating a Council for Sustainable Development
- The CON-CAUSA agreement with the US in 1994 which promotes:<sup>19</sup>
  - Clean and efficient use of energy
  - Identification, conservation and sustainable use of the biodiversity of the region
  - Improvement of environmental protection standards
- Development of a process which coincided with USIJI requirements
- Established an agency within government tasked with JI projects
- Provided for administration of incentives for forestry projects
- Began a certification program to add validity to the process

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<sup>18</sup> Seth Dunn, Can the North and South Get in Step, World Watch, Nov/Dec. 1998. Pp. 23-24.

\* Four of these were renewable energy projects and 3 were sequestration one of which combined two prior proposed projects. Two additional projects were accepted subsequently bringing the total to nine projects in Costa Rica—about one-third of the total projects.

<sup>19</sup> Oscar E. Acuna, Minister Counselor of Economic Affairs, The Costa Rican Sustainable Development program, February 11, 1998.

The specific programs pertaining to sequestration were:

- The Protected Areas Program (PAP) which aims at consolidating parks and wildlife reserves under government ownership in a continuation of a policy which began earlier and as of 1998 encompassed 30% of the entire territory of the nation of 19,700 square miles. The target is 1.3 million additional acres to be brought under protection while sequestering in excess of 15 million tons of carbon.

An important note is that the proceeds from this program are destined for uses in connection with the acquisition and protection of additional land. Preliminary arrangements have already been made with Environmental Financial Products to handle the sale of CTOs resulting from the program.

A keynote is that the program also has a monitoring and verification protocol which has been devised by Societe' Generale de Surveillance (SGS) of Geneva's Forestry division in Oxford, UK. This has given this project a high visibility as a model which might provide the comfort level required for investment and prompted Jose' Maria Figueres to comment that, "Independent certification such as that provided by SGS creates the confidence necessary to make trade in greenhouse gas reductions a reliable financial tool for industrialized countries to meet their emission reduction commitments in a cost-effective manner." There have also been some insurance products which would also reduce risk for potential investors.

The one sale made thus far was orchestrated between Costa Rica and the Norwegian government, ABB, Kvaerner Energy and Eeg-Henriksen Anlegg which paid \$10 per CTO for 200,000 tons. The \$2 million proceeds was used to fund forestry projects on private land.<sup>20</sup> After the Kyoto Summit, the price was raised to \$20/ton but no sales have taken place at that level. As of April 1998 SGS had certified 1 million tons and by November this had risen to 8.75 million tons with a projection of 13 million tons per year thereafter.<sup>21</sup>

- The second program is the Private Forest Program or PFP which provides subsidies for reforestation and afforestation activities on private lands. In order to qualify, there must be a commitment for twenty years with incentives for a five year period which includes \$113 per acre plus forgiveness on taxes for the land under forestry. Farmers are allowed to undertake selective harvesting to supplement their income and are paid a certain amount per acre for forestry materials.

### **Detailed Analysis of One Reforestation Program**

While the preceding provides a general overview of how these programs operate, knowledge of the details are essential to determine cash flows which may or may be able to sustain other activities. We have been fortunate enough to be in contact with Reforest

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<sup>20</sup> Ann Goodman, Carbon Trading Up and Running, Tomorrow Magazine. May/June 1998.  
<http://www.envifi.com/News/tomorrow.htm>

<sup>21</sup> Meeting with Jose' Maria Figueres at on 16 Nov 1998.

the Tropics (RTT,) a group which undertook one of the nine Joint Implementation programs in Costa Rica. They have supplied detailed information which provides the inputs and outputs required to analyze one form of program.

In the RTT program, funds are solicited from private and public groups to offset their carbon requirements by the planting of Klinki trees, not as a plantation scheme but intermixed with native species so as to maintain biodiversity and avoid all the problems of monoculture crops. The process begins with a determination of what the annual carbon usage of the client is based upon a computer spreadsheet with the following inputs:

- Gallons of oil used for heating
- kWh of electricity
- Hundred Cubic feet of natural gas or propane
- Gallons of gasoline or diesel fuel
- Number of vehicles and gallons used per year per vehicle

Each of these uses a commonly available and accepted standard conversion factor to determine CO<sub>2</sub> responsibility. In the case of electricity, since it has a mix of primary fuels, the regional EPA average is used in the determination.

Once the responsibility is determined, this is converted into the number of acres/hectares required to offset the responsibility based upon a constant where 16 tons of CO<sub>2</sub> are sequestered in each acre. The one-time, all inclusive cost per acre is currently \$955 per acre for a program period of 30 years. This translates into 480 tons of CO<sub>2</sub> (16 tons/year X 30 Years) or \$1.99 per ton of CO<sub>2</sub>. Using the conversion factor of 3.66 tons of CO<sub>2</sub> equate to 1 ton of carbon, the cost of sequestering comes to \$7.28 per ton of carbon which is below the \$10/ton of carbon in the Norwegian trade and well below the \$20/ton of carbon requested after the Kyoto Protocols were fashioned. More detail on variability of these values will be examined in following section. The expenditure of the funds breaks out as shown in Table I on the following page.<sup>22</sup>

The marketing of the CTOs realized from such a project can be accomplished in several ways. Much of this depends upon whether financing is available but any detailed discussion is beyond the scope of this paper.

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<sup>22</sup> Note: There may be slight variations from project to project and some rounding errors may be present.

**Table I.**

<b>Farmer Receives:</b>	<b>Per Acre</b>	<b>Per ton CO<sub>2</sub></b>	<b>Per Ton Carbon</b>
• Contribution to treeplanting and maintenance cost	\$303.52	\$18..97	\$69.54
• Reserve funds for seedlings (remainder for farmer)	\$101.17	\$6.32	\$23.17
• Farmer education, site selection, measurement	\$30.00	\$1.88	\$6.89
• Technical assistance to farmer	\$34.05	\$2.13	\$7.81
<b>Subtotal</b>	<b>\$468.74</b>	<b>\$29.30</b>	<b>\$107.41</b>
<b>Other Expenses:</b>			
• Trust fund for 5 year inventory, certify emissions	\$50.00	\$3.13	\$11.47
• Nursery support, administration	\$10.00	\$0.63	\$2.31
• Legal expense, accounting	\$14.26	\$0.89	\$3.26
• Carbon monitoring & applied research on site	\$30.00	\$1.88	\$6.89
• Project management, future	\$200.00	\$12.50	\$45.83
• Administration	\$58.00	\$3.62	\$13.27
<b>Subtotal</b>	<b>\$362.26</b>	<b>\$22.65</b>	<b>\$83.03</b>
Direct Costs	\$831.00	\$51.95	\$190.45
Other development cost (13%)	\$124.65	\$7.79	\$28.56
<b>Total costs</b>	<b>\$955.65</b>	<b>\$59.74</b>	<b>\$219.01</b>
<b>Total Annual Cost Over 30 years</b>	<b>\$31.86</b>	<b>\$1.99</b>	<b>\$7.30</b>

Table I information courtesy of Dr. Herster Barres of Reforest the Tropics.

### **Trends in CTO/CER Market Prices**

While the information on the value of CTOs/CERs was assumed to be in the \$20/ton of carbon<sup>23</sup> due to the single earlier transaction at \$10/ton which was prior to Kyoto, other literature did not confirm that this would be the going price in the current market. To ascertain both the current market and attempt to determine some trends in the direction of that market, a set of questions was devised to ask of the leading offset marketers and theorists in the field. A list of the questions is attached as Appendix A.

Six of the most knowledgeable people in the world responded to the questions in varying degrees. Many would not answer all questions because the questions were either too conjectural at this time or they might reveal information which was considered proprietary. For this reason the information presented from those interviews is fragmented at best but, in the aggregate, may supply some loose insight into the general trend which the value of emission offsets may take.

<sup>23</sup> It should also be noted that at many times it was not explicitly clear whether it was “carbon” or “carbon dioxide” which was being assigned a value. While Table I has shown both for reasons which will become apparent later, the failure to explicitly identify which commodity is being discussed can misunderstandings since a ton of carbon is valued 3.667 times that of a ton of CO<sub>2</sub>. Normally, the convention has become to refer to offsets for power projects in terms of tons of CO<sub>2</sub> while sequestration projects talk of tons of carbon sequestered.

**Environmental Financial Products (<http://www.envifi.com>):** Dr. Michael Walsh of EFP (formerly Centre Financial Products) works with Dr. Richard Sandor who has been one of the earliest advocates of emission reductions through cap and trade mechanisms. They have also been engaged to act as traders in connection with the PAP program mentioned earlier. Dr. Walsh was congenial but at the same time reserved in the information he was ready to disclose on CTO value and trends. He noted that current values are proprietary information and may vary on a case-by-case basis due to market preferences. The value of the certification of a forestry project may or may not be better than a certified renewable energy project. The cost of a project definitely increases when certification is built into it. He had no estimate of what the price of an emission would be in one or two years calling it the “\$64 billion dollar question.”

As to the status of CDM in relation to sequestration, he is concerned about this and his firm is actively working to influence outcomes. For renewables, the instigation of a PV project in a nation which is highly dependent on hydro, such as Costa Rica, would not receive emission reduction credits since there is no displacement of fossil fuel use. He believes that the passage of the Chaffee/Lieberman/Mack early credit bill in the U.S. would provide a major stimulus to the market but questions the chances for passage.

**Trexler and Associates (<http://www.climateservices.com>):** Michael Burnett of TAA was more open. TAA works with developers to package projects or portfolios of projects and take an equity position. They also perform due diligence.

Mr. Burnett provided a range of values for a ton of carbon dioxide (note that carbon dioxide was used as the unit) from \$1.00 to \$60.00. In general, forestry projects were down in the \$2.00 and below range with greater value for renewable energy based projects. They have developed a model which looks at the current market. In the next five years he sees the price going up to the lower double digits and ten years out he would see it at \$20/ton. Much of this speculation he ties to just how the world economy will be doing as well as the perception of climate change.

He was optimistic on CDM noting that there is a vested interest by all sides to make it work and that even non-Annex I nations such as Argentina which has made commitments could use it to better the lives of its people. He believes that the Chaffee/Lieberman/Mack early credits legislation was very important and would be a significant driver.

As a side note, this was the firm which handled the 1989 offset arrangements for Roger Sant, Chairman of AES for a coal plant which was built in Connecticut. The offsets included planting 52 million trees in Guatemala through CARE to offset emissions from a coal plant in Connecticut.

**Cantor-Fitzgerald:** Carlton Bartles, who was instrumental in setting up emissions trading for SO<sub>x</sub>, was open but his honest appraisal was that nothing is yet officially recognized but in some ways even that that is not a necessity. He is aware of high-quality

offsets selling for \$1.00 to \$2.00 per ton of CO<sub>2</sub>. He also noted that the value of PV will depend upon what it displaces and may have more value in off-grid applications.

For future trends he notes that much of this will depend upon the political climate's ability to spur the market. Since there is no legal requirement or mandate to provide it value, it only has a very marginal profit associated with it.

As for credits for sequestration, he says it is currently politically mired as well as faces implementation problems. He makes no bets on the political aspects of it and believes that implementation can get bogged down due to certain emission sequestration offsets being difficult to demonstrate. In short, he says sequestration is a hard sell which needs compelling projects, ongoing maintenance and rules.

He believes that the early emissions legislation will work out just fine and it is a good bill because it has elements of domestic control.

**Econenergy International Corporation (<http://www.eic-co.com>):** Dr. Joel Swisher supplied some information but was quite reserved with what information he would provide without consulting contracts. He used the Costa Rican trade to the Norwegian government and industries as the current benchmark of \$10/ton carbon and noted that Costa Rica was currently asking for \$20/ton but had received no takers. He also has heard of prices as low as \$1 to \$2 per ton. He believes that the quality of a Costa Rican offset is high because it has gone through the certification process and that there is a correlation between the this quality and the price it will be able to command

**Centre for Sustainable Development in the Americas (<http://www.csdanet.org>):** Christiana Figueres answered the questions via E-mail and informed us that while Costa Rica has sold CTOs at \$10/ton carbon, no sales have taken place for the past 18 months. She said that non-certified offsets vary between \$.50 and \$3.00 per ton carbon and they mostly involve forestry projects.

As to future trends, she cited one World Bank figure which projected they could be worth as much as \$24 to \$36 in 2008 but she noted that this would be a difficult figure to know before that point as so many of the rules are as yet unwritten. She also said that the details of CDM allowing sinks will not be decided until some time after the IPCC report is issued in May 2000. A decision will follow heated debate with initial decisions coming by November 2000.

She also believes that passage in the US of early emissions credits will hopefully encourage corporations to start reducing in the near term so they will not be so panic driven as deadlines draw near. It is also unclear whether early crediting will allow for international offsets or forestry project.

**Global Business Network ([http:// www.gbn.org](http://www.gbn.org)):** Irving Mintzer said that most of the talk he has heard listed offsets at \$1 \$2 per ton and that even the \$10/ton deal with Norway was mostly symbolic. He has heard of none at \$20 per ton. He sees the offsets

moving in tandem with the price of oil so that if offsets today are \$2/ton with oil at \$9/barrel, he would expect that a price escalation in oil would bring higher values for emission offsets.

Timewise, he see mostly symbolic trades for the next one to two years with some futures activity leading into small volume transactions with erratic prices in the two to five year span with prices gradually increasing in longer time frames. While admitting that the estimate is a crap shoot, we might experience offsets at \$20 to \$50 per ton in the 2011-2012 period.

He believes that eventually CDM will allow provisions for the sequestration of carbon but maybe not until the 2002-2004 period or after. While low oil prices will make it difficult for renewables to compete, CDM should be successful in steering some investment into them. He also believes the early credit legislation is fine in principle but questions remain on how to make initial allocations. There are also questions on how a carbon market will operate in that they may be bought for a thirty year period or by the year or ten years streams but much of this in as yet unresolved.

All the aforementioned reinforces that at the current time, the market is too uncertain to predict eligibilities of sinks, cash values per ton of carbon sink or the number of tons which might be on the market.

### **Sulfur Dioxide Emissions Trading as a General Indicator**

What might be instructive, in a limited sense, is to review the prices of another emission commodity already being traded on the Chicago Board of Trade (CBOT) to see if any relevant trends become apparent. In this case, the emission being tracked is SO<sub>2</sub> but due to the limited history of that market, it appears that any evaluation using that information is also inconclusive except to indicate a significant escalation in price in the 1997-1998 timeframe and a steadily increasing market in trades. See charts on the following pages.

A recent article notes:<sup>24</sup>

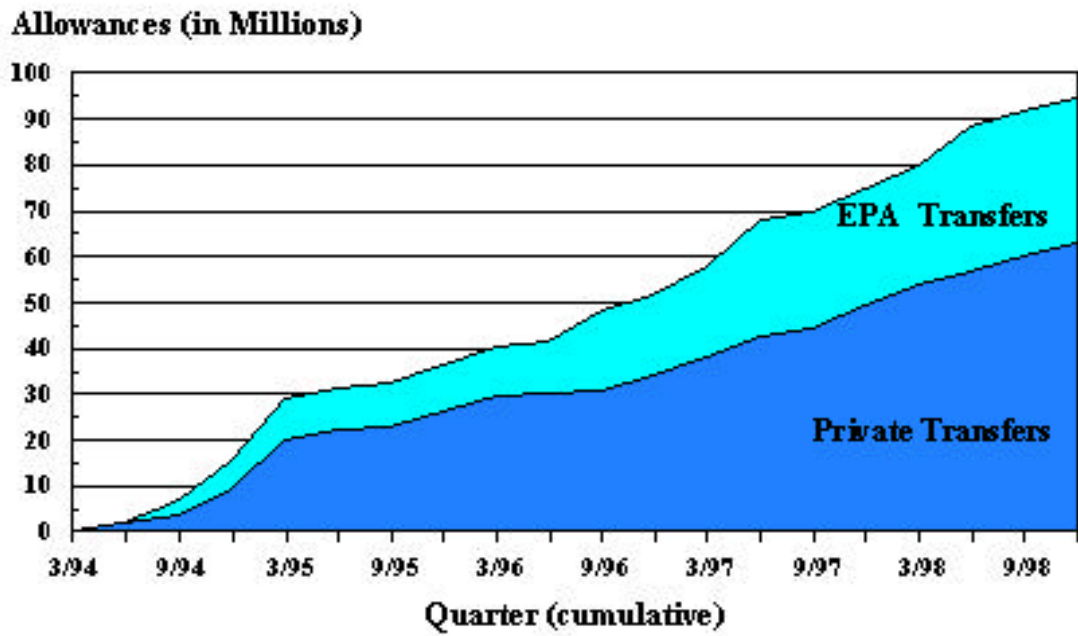
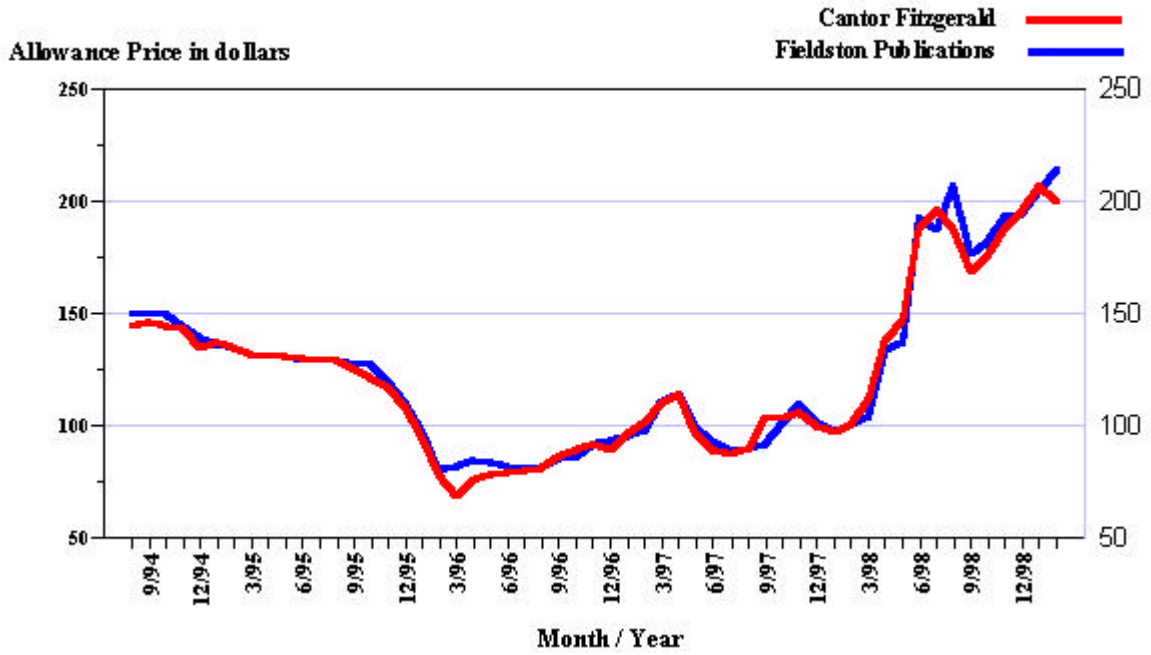
``The success of this program has been phenomenal. It integrates environmental management with the routine running of a business," said Michael Walsh, senior vice president of Environmental Financial Products Ltd. in Chicago. The firm advises companies on dealing in the pollution allowances.

Wednesday's auction involved 152,510 ``spot" allowances, which are usable now, and 125,000 not exercisable until 2006. The average price of the spot allowance was \$207, and the average for the 2006 allowance was \$179.79. ....

Last year, about the same number of allowances were sold but for far less--\$117 for the spot contract and \$111 for one beginning in 2005. In 1996, prices were even lower--less than \$80 on some markets.

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<sup>24</sup> David Roeder, Pollution Auctions Allowance Paying Off, Suntimes, 29 March 1999.



Eric Meier, an economist with the CBOT, said prices are rising because more firms need to buy the allowances. At the same time, the available allowances are gradually decreasing under mandate of the EPA, he said.

The EPA said 9.5 million allowances were traded in 1998, 20 percent more than the previous year. Experts said several speculators are active in the market.

They could be right that prices will rise. In 2000, the EPA extends its emissions rules to more than 2,100 utility plants, five times the number now in the program, yet its cap on sulfur dioxide emissions will increase only slightly.

As a result, more volatility is likely in the price of allowances, Sandor said.

While there is no guarantee that CTO sales will follow a similar upward trajectory, any market which develops should be closely monitored to determine at what point the trading system for carbon might become viable. Ideally, program development planning should take place while the market is not yet mature and it should be instantly ready for launch when a trigger price for CTOs is attained and remains stable or escalates for a predetermined period.

### **Conclusion**

There is very little that can be said with any certainty concerning the use of carbon sinks as an emissions reduction strategy. Many uncertainties will preclude a vibrant market from developing in the near term. The reasons for this include but are not limited to:

- Widely disparate positions on the use of CDM, trading and sinks held by many (but not all) developing nations as opposed to developed nations
- Lack of consensus on scientific and political decisions as to terminology and eligibility of various forms of sinks.
- Lack of agreement on whether eligible sinks can be used in conjunction with CDM and in what amounts
- Whether CTOs/CERs realized through sinks activity will be tradable

Only after the IPCC completes its report in May of 2000 which more exactly defines eligibilities and the Conference of the Parties agrees to them as well as clarifying other operating rules, will there be any certainty associated with such markets which will attract serious investors.

Until that time, only early adopters, those positioning themselves as “green” for branding purposes and speculators will actively pursue projects in the risk-laden market.

### Questions Pertaining to Offsets

- 1) What is the current value of a certified tradable offset?
- 2) Is there a price difference between certified offsets vs others? Are non-certified ones being traded?
- 3) What do you expect the price to be in 1 year? 2 years? 5 years?
- 4) If no estimates can be made for these spans, could they envision a general trend? Up? Down? Similar to SO<sub>2</sub> markets in trend?
- 5) What effects does new research have which appears to show carbon exhalation by stressed forests?
- 6) What methods does SGS Forestry in Switzerland use to certify the CTO's? Is this likely to be accepted and does it prevent double sales of the same offsets?
- 7) What is likely status of CDM in relation to sequestered carbon. Will it be allowed? To what degree? Any details emerging?
- 8) How important might legislation like the Chafee/Lieberman/Mack bill which allows early credit to US corporations be for sales of offsets? Chances of passage?
- 9) What is the breakdown of the \$20/tonne? Planting/preservation cost and follow through, certification costs, other transaction costs, other costs, profits?