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## *Voluntary Carbon Offsets: Overview and Assessment*


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**Abstract.** In the United States and around the world, a growing number of businesses, interest groups, and individuals are purchasing carbon offsets and asserting that all or part of their greenhouse gas (GHG) emitting activities (e.g., air travel, corporate events, or personal automobile use) are "carbon neutral" as a result. These exchanges represent a voluntary market for carbon offsets, because there is currently no federal requirement that GHG emissions be curtailed. The concept of purchasing carbon offsets to achieve carbon neutrality (or reduce one's "carbon footprint") has spurred both interest and debate in recent years. This report provides an overview of carbon offsets and examines some of the issues that are generating debate (and controversy). Although there is some overlap of issues between voluntary carbon offsets and the offsets used to comply with mandatory reduction regimes, this report focuses on the voluntary offsets market. Unless otherwise stated, the carbon offsets in this report refer to those exchanged in the voluntary market.


# Voluntary Carbon Offsets: Overview and Assessment

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# Summary

Businesses and individuals are buying carbon offsets to reduce their "carbon footprint" or to categorize an activity as "carbon neutral." A carbon offset is a measurable avoidance, reduction, or sequestration of carbon dioxide ($CO_2$) or other greenhouse gas (GHG) emissions. Offsets generally fall within the following four categories: biological sequestration, renewable energy, energy efficiency, and reduction of non-$CO_2$ emissions.

In terms of the carbon concentration in the atmosphere, an emission reduction, avoidance, or sequestration is beneficial regardless of where or how it occurs. A credible offset equates to an emission reduction from a direct emission source, such as a smokestack or exhaust pipe. The core issue for carbon offset projects is: do they actually *offset* emissions generated elsewhere? If the credibility of the voluntary offsets is uncertain, claims of carbon neutrality may be challenged.

Evidence suggests that not all offset projects are of equal quality, because they are developed through a range of standards. In the voluntary market, there are no commonly accepted standards. Although some standards are considered stringent, others are less so. At least 30 companies and organizations (domestic and international) sell carbon offsets to individuals or groups in the international, voluntary carbon market. Two recent studies that examined many of the offset sellers found a general correlation between offset price and offset quality.

Due to the lack of common standards, some observers have referred to the market as the "wild west." This does not suggest that all carbon offsets are low quality, but that the consumer must necessarily adopt a buyer-beware mentality when purchasing carbon offsets. This places the responsibility on consumers to judge the quality of carbon offsets.

The viability of the voluntary offset market may influence future policy decisions regarding climate change mitigation. For example, credible offsets could play an important role, particularly in terms of cost-effectiveness, in an emissions control regime. There is some concern that the range in the quality of voluntary market offsets may damage the overall credibility of carbon offsets. If this occurs, it may affect policy decisions concerning whether or not to include offsets as an option in a mandatory reduction program.

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## Introduction

In the United States and around the world, a growing number of businesses, interest groups, and individuals are purchasing carbon offsets and asserting that all or part of their greenhouse gas (GHG) emitting activities (e.g., air travel, corporate events, or personal automobile use) are "carbon neutral" as a result. These exchanges represent a voluntary market for carbon offsets, because there is currently no federal requirement that GHG emissions be curtailed.

The concept of purchasing carbon offsets to achieve carbon neutrality (or reduce one's "carbon footprint") has spurred both interest and debate in recent years. This report provides an overview of carbon offsets and examines some of the issues that are generating debate (and controversy). Although there is some overlap of issues between voluntary carbon offsets and the offsets used to comply with mandatory reduction regimes, this report focuses on the voluntary offsets market. Unless otherwise stated, the carbon offsets in this report refer to those exchanged in the voluntary market.



## What are Carbon Offsets?

A carbon offset is a measurable avoidance, reduction, or sequestration of carbon dioxide ($CO_2$) or other greenhouse gas (GHG) emissions. Offsets generally fall within the following four categories (discussed in greater detail later in the report): biological sequestration, renewable energy, energy efficiency, and reduction of non-$CO_2$ emissions.

Carbon offsets are sometimes described as project-based because they typically involve specific projects or activities that reduce, avoid, or sequester emissions. Because offset projects can involve different GHGs,[1] they are quantified and described with a standard form of measure: either in tons of carbon-equivalents or $CO_2$-equivalents (frequently expressed as tC-e or t$CO_2$-e).

To be considered a credible offset, the emissions reduced, avoided, or sequestered need to be *additional* to business-as-usual: i.e., what would have happened anyway. In the context of a mandatory GHG emission reduction regime, an offset can come only from sources not covered by the reduction program (i.e., outside the emissions cap).[2] Emission reductions from regulated sources would be required under the cap, and thus would not be *additional*. By comparison, a reduction activity may be additional if it occurs from a source in a nation that does not limit the source's GHG emissions. As more nations (or U.S. states) establish mandatory caps on emission sources, the universe of potential carbon offsets will shrink.

## The Size of the Voluntary Carbon Offset Market

There is currently no registry or tracking system that follows exchanges in the voluntary market. For this reason, the precise size or value of the voluntary offset market is unknown. However, a

[1] Six GHGs have been identified by the United Nations Framework Convention on Climate Change (UNFCCC) as being those of major interest: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluorane.

[2] This approach is part of the European Union's (EU) Emission Trading Scheme (ETS), which the EU members use to meet their Kyoto Protocol commitments. For more information, see CRS Report RL34150, *Climate Change and the EU Emissions Trading Scheme (ETS): Kyoto and Beyond*, by Larry Parker.

series of World Bank reports—*The State and Trends of the Carbon Market*—provides some estimates for recent years.[3] These estimates are listed in **Table 1**.

**Table 1. Estimates of the Volume and Value of the Voluntary Carbon Market**

| Year | Estimated Volume of Transactions (in million metric tons of $CO_2$-equivalents, $MtCO_2$-e) | Estimated Value of Transactions |
|---|---|---|
| 2004 | 3 $MtCO_2$-e | $6 million |
| 2005 | 6 $MtCO_2$-e | $44 million |
| 2006 | 10 $MtCO_2$-e | $100 million |

**Source:** Prepared by Congressional Research Service with data from the following: 2004 estimates from World Bank 2006, *State and Trends of the Carbon Market 2006*; 2005-2006 data from World Bank, 2007, *State and Trends of the Carbon Market 2007*.

The estimates indicate that the size of the market has increased rapidly every year since 2004. The World Bank report cites forecasts of increasing growth in coming years. One projection (described as "optimistic" by the World Bank) indicates that the volume of transactions in the international voluntary market will be 400 $MtCO_2$-e by 2010.[4] To put this figure in context, the U.S. GHG emissions were approximately 7,200 $MtCO_2$-e in 2005.[5]

## Carbon Offset Integrity Issues

A primary concern regarding voluntary carbon offsets is their integrity. It is generally agreed that a credible offset should equate to an emission reduction from a direct emission source, such as a smokestack or exhaust pipe. Several criteria determine the integrity or quality of an offset project.

### Additionality

This is generally considered to be the most significant factor that determines the integrity of the carbon offset. Additionality refers to whether the offset project (e.g., wind farm) would have gone forward on its own merits (or own financial benefits) without the support of the offset market. In other words, would the project have happened anyway? If the project would have occurred without the financial support of the offset buyer, the emission reductions generated from the project would not be additional.

The additionality criterion is at the crux of an offset's integrity, but additionality can be difficult to assess in practice. The standards used to analyze a project's additionality vary, and some groups may downplay the importance of this attribute. An offset seller who employs a more stringent additionality analysis will likely offer "higher quality" offsets.

[3] The World Bank report states that the estimates are based on an unpublished study. The authors of the study provided the estimates to the World Bank prior to its publication. World Bank, 2007, *State and Trends of the Carbon Market 2007*, p. 10.

[4] The 2007 World Bank (p. 41) report cites ICF, 2006, *Voluntary Carbon Offsets Market: Outlook 2007*.

[5] U.S. EPA, 2007, *Inventory of U.S. Greenhouse Gas Emissions and Sinks:1990 – 2005.*

## Baseline Determination

To determine the amount of emissions avoided by an offset project, project managers must establish an emissions baseline: an estimate of the "business-as-usual" scenario or the emissions that would have occurred without the project. If project managers inaccurately estimate the baseline, the offsets sold may not match the actual reductions achieved. For example, an overestimated baseline (projecting more emissions than would have been emitted in the project's absence) would generate an artificially high amount of offsets. Baseline measurement may present technical challenges. In addition, project developers would have a financial incentive to err on the high side of the baseline determination, because the higher the projected baseline, the more offsets generated.

## Double Counting

A carbon offset is meaningful if it is only counted once. To be credible, when an offset is sold, it should be retired and not sold again or counted in other contexts. However, opportunities for double-counting exist. For example, a U.S. buyer may purchase offsets generated through the development of a wind farm in a country, state, or locality that has established GHG emissions targets. The U.S. buyer will count the offsets, which may have been purchased to counter an increase in personal air travel. In addition, the nation (state or locality), in which the wind farm is located, may see an emissions reduction due to the wind farm. This decrease will be reflected in the nation's GHG emissions inventory. Thus, the offset project (wind farm) may replace other reduction activities that the nation might have taken to meet its target. A tracking system needed to avoid such double-counting does not exist.[6]

Some may argue that double-counting is less of a problem if the offset project occurs in a U.S. state (county or city) with only a voluntary target (as opposed to a nation subject the Kyoto Protocol). However, the impact would be the same if the state is eventually part of a federal emissions reduction program, and the state is allowed to take credit for the earlier reductions associated with the offset project. By taking credit for an earlier reduction, the state will need to make fewer reductions to be in compliance with the new mandatory program.

## Permanence

When carbon offsets are generated from a project, there should be confidence that the emission offsets are permanent—that the emissions are not merely postponed. This characteristic is most pertinent to biological sequestration projects, specifically forestry activities. For example, buyers need some assurance that the land set aside for forests will not be used for a conflicting purpose (e.g., logging or urban development) in the future. Although natural events (fires or pests) are hard to control, human activity can be constrained through legal documents such as land easements. In addition, an offset could come with a guarantee that it would be replaced if the initial reduction is temporary.

[6] See Anja Kollmuss, 2007, Carbon Offsets 101, *World Watch*.

# Carbon Offset Types and Potential Integrity Concerns

In the voluntary market, carbon offsets can be generated from multiple economic sectors. This report discusses carbon offsets grouped into the four categories identified above. Each category contains a list of possible carbon offset examples. Specific integrity issues may be associated with particular offset categories. These issues are discussed below. The potential problems highlighted below should not necessarily rule out entire carbon offset categories. If offset project developers can address these potential obstacles, the offsets may be credible. However, it may be difficult for offset buyers to know if these problems were addressed (as discussed later in the report).

## Biological Sequestration

Trees, plants, and soils sequester carbon, thereby reducing its amount in the earth's atmosphere.[7] Biological sequestration projects generally involve activities that either increase sequestration or preserve an area's existing sequestration ability that is under threat (e.g., from logging or development). This offset category includes sequestration that results from activities related to agriculture and forests, and is sometimes referred to as land use, land use change and forestry (LULUCF) projects. Example of these projects include:

- Planting trees on previously non-forested land (i.e., afforestation)
- Planting trees on formerly forested land (i.e., reforestation)
- Limiting deforestation by purchasing forested property and preserving the forests with legal mechanisms (e.g., land easements)
- Setting aside croplands from production to avoid emissions released during crop production
- Promoting practices that reduce soil disruption (e.g., conservation tillage)

Compared to the other offset categories, biological sequestration projects offer the most potential in terms of volume (particularly forestry projects). However, this category is arguably the most controversial, because of several integrity issues that are typically associated (or perceived to be associated) with biological sequestration projects.

Some agricultural sequestration offsets may raise concerns of additionality: i.e., the sequestration activity would have happened regardless of the payments received from offset buyers. For example, farmers may be able to generate offsets by conducting no-till operations on their land, but for the offsets to be credible, the impetus to adopt this practice should be driven by the financial gain from the offset market. If the no-till practice was part of normal operations before the offset market, then the offset would fail the additionality test. There is anecdotal evidence indicating that some farmers have been using the no-till technique for years, but still received compensation for the offsets.[8] If this is the case, this would be a fairly straightforward example of a non-additional offset. Should this bar other farmers, who have not been practicing conservation measures (e.g., no-till farming), from receiving offsets for initiating such measures? Arguably the measures provide some benefit on their own (e.g., less fuel use), because some farmers have been

[7] For more information on these processes see CRS Report RL34059, *The Carbon Cycle: Implications for Climate Change and Congress*, by Peter Folger.

[8] Jeff Goodell, 2006, "Capital Pollution Solution," *New York Times Magazine*, July 30, 2006.

using the techniques for years. However, the offset incentive may be a primary driver at some farms. This example demonstrates the difficulties associated with proving that a project is additional.

Biological sequestration offset projects may present challenges in terms of measurement. This issue is especially relevant to forestry-related offsets. The carbon cycle in trees and soils is complex: variations across tree species, ages, and geographic locations increase the measurement challenge.[9] In addition, other variables complicate the measurement of reductions from forestry projects. For example, a recent study in the *Proceedings of the National Academy of Sciences* stated:

> We find that global-scale deforestation has a net cooling influence on Earth's climate, because the warming carbon-cycle effects of deforestation are overwhelmed by the net cooling associated with changes in albedo[10] and evapotranspiration.[11] Latitude-specific deforestation experiments indicate that afforestation projects in the tropics would be clearly beneficial in mitigating global-scale warming, but would be counterproductive if implemented at high latitudes and would offer only marginal benefits in temperate regions.[12]

As mentioned earlier, biological sequestration projects often raise questions of permanence: i.e., whether the activity that generates offsets will continue. Although many observers expected biological sequestration offsets to dominate the international market, this has not been observed in practice. Concern of permanence has been one of the issues that has hindered the development of biological sequestration offsets in developing nations.[13]

## Renewable Energy Projects

Renewable energy sources generate less GHG emissions (wind and solar energy produce zero emissions) than fossil fuels, particularly coal. Therefore, use of renewable energy sources would avoid emissions that would have been generated by fossil fuel combustion. These avoided emissions could be sold as carbon offsets. Historically, renewable energy sources—wind, solar, biomass—have been more expensive (per unit of energy delivered) than fossil fuels in most applications.[14] Sales of renewable energy offsets may provide the financial support to make a renewable energy more economically competitive with fossil fuels. Potential renewable energy offset projects may include:

- Constructing wind farms to generate electricity
- Installing solar panels

[9] For more on these challenges, see CRS Report RL31432, *Carbon Sequestration in Forests*, by Ross W. Gorte.

[10] Albedo refers to the reflectivity of the Earth's surface. For more on this effect, see CRS Report RL33849, *Climate Change: Science and Policy Implications*, by Jane A. Leggett.

[11] Evapotranspiration is the sum of evaporation and transpiration. The transpiration aspect of evapotranspiration is essentially evaporation of water from plant leaves. For more on this issue see the U.S Geological Survey website at http://ga.water.usgs.gov/edu/watercycleevapotranspiration.html.

[12] Govindasamy Bala, et al, 2007, "Combined climate and carbon-cycle effects of large-scale deforestation," *Proceedings of the National Academy of Scieneces*, 104: 6550-6555.

[13] Frank Lecocq and Philippe Ambrosi, 2007, The Clean Development Mechanism: History, Status, and Prospects, *Review of Environmental Economics and Policy*, Winter 2007, pp. 134-151.

[14] This comparison does not account for the externalities associated with fossil fuel combustion: air pollution, environmental degradation, and health problems linked to emissions.

- Retrofitting boilers to accommodate biomass fuels

Some renewable energy offsets may raise concerns of additionality. Several offset sellers offer renewable energy certificates or credits (RECs) as carbon offsets. One REC represents the creation of 1 megawatt-hour of electricity from a renewable energy source. RECs generally convey the environmental attributes of renewable energy projects, and RECs may be sold to promote further use of renewable energy. However, a REC does not necessarily equate with a carbon offset. A credible offset must be *additional* to the status quo; RECs are not subject to the same standard. Although some offset sellers closely scrutinize the RECs they offer for sale as offsets, there is no system or standard in place to ensure that RECs are additional.[15]

Several factors, other than $CO_2$ emission reductions, may drive the development of a renewable energy project. Although renewable energy has historically been more expensive, higher fossil fuel prices and tax incentives[16] have made renewable energy more competitive in recent years. Moreover, many states have enacted or are developing Renewable Portfolio Standards (RPS). An RPS requires that a certain amount or percentage of electricity is generated from renewable energy resources. Twenty-eight states have implemented or are developing some type of RPS.[17] Although some sellers will not issue RECs that were counted towards an RPS, it is uncertain whether all sellers follow this protocol.[18] These factors complicate the determination of additionality regarding renewable energy offsets projects, particularly offsets based only on RECs.

## Energy Efficiency

An improvement in a system's energy efficiency will require less energy to generate the same output. Advances in energy efficiency generally require a financial investment. These capital investments may pay off in the long run, but may be unprofitable in the short-term, particularly for small businesses or in developing nations. Examples of possible energy efficiency offset projects include:

- Upgrading to more efficient appliances or machines
- Supporting construction of more energy efficient buildings
- Replacing incandescent light bulbs with fluorescent bulbs

Energy efficiency improvements are sometimes described as a "no regrets" policy, because the improvements would likely provide net benefits (e.g., cost savings) regardless of their impact on other concerns (climate change or energy independence). Thus, the issue of additionality may be a particular concern for energy efficiency offsets. For example, in some cases, it may be difficult to discern if the improvements would have been made regardless of the offset market.

[15] Anja Kollmuss and Benjamin Bowell, "Voluntary Offsets For Air-Travel Carbon Emissions Evaluations and Recommendations of Voluntary Offset Companies," Tufts Climate Initiative, Revised April 5, 2007, p. 13.

[16] See CRS Report RL33578, *Energy Tax Policy: History and Current Issues*, by Salvatore Lazzari.

[17] See EPA, Summary of State Clean Energy-Environment Policy Data Table (current as of 1/1/2007), at http://www.epa.gov/cleanenergy/stateandlocal/activities.htm. Additional states identified by the Pew Center on Global Climate Change, Map: States with Renewable Portfolio Standards, at http://www.pewclimate.org.

[18] See Anja Kollmuss and Benjamin Bowell, "Voluntary Offsets For Air-Travel Carbon Emissions Evaluations and Recommendations of Voluntary Offset Companies," Tufts Climate Initiative, Revised April 5, 2007.

Offset ownership is another potential challenge regarding some energy efficiency offsets. Energy efficiency improvements may occur at a different location than the actual reduction in emissions. For example, a business that runs its operations with purchased electricity will use less electricity if energy efficiency improvements are made, but the actual emission reductions will be seen at a power plant. This may create a double-counting situation. Although the federal government has not set a mandatory GHG emission reduction, several states and local governments have enacted limits.[19] If the state counts the emission reductions at the electricity plant towards its goal, while the business sells the offsets, the reductions will be counted twice.[20]

## Reduction of Non-$CO_2$ Emissions from Specific Sources

There are multiple GHG emissions sources, whose emissions are not generally controlled through law or regulation. These sources—primarily, agricultural, industrial, and waste management facilities—emit non-$CO_2$ GHGs as by-products during normal operations. In many cases, the individual sources emit relatively small volumes of gases, but there are a large number of individual sources worldwide. In addition, these non-$CO_2$ gases emitted have greater global warming potentials (GWP) than carbon dioxide.[21] Offset projects in this category could provide funding for emission control technology to capture these GHG emissions. Examples of emission capture opportunities include:

- Methane ($CH_4$) emissions from landfills, livestock operations, or coal mines (GWP = 25)
- Nitrous oxide ($N_2O$) emissions from agricultural operations or specific industrial processes (GWP = 298);
- Hydrofluorocarbon (HFC) emissions from specific industrial processes, such as HFC-23 emissions from production of HCFC-22 (GWP of = 14,800)
- Sulfur Hexafluoride ($SF_6$) from specific industrial activities, such as manufacturing of semiconductors (GWP = 22,800)

This offset category is relatively broad, as it can involve many different industrial activities. As such, there are offset types in this category that are generally considered high quality, and others that have generated some controversy. For example, methane capture (and destruction through flaring) from landfills or coal mines has a reputation as a high quality offset. These projects are relatively easy to measure and verify, and in many cases would not have occurred if not for the offset market.

Offsets involving abatement of HFC-23 emissions from production of HCFC-22 (primarily used as a refrigerant) have spurred controversy.[22] Although offsets from HFC-23 abatement are

[19] See CRS Report RL33812, *Climate Change: Action by States To Address Greenhouse Gas Emissions*, by Jonathan L. Ramseur.

[20] One way to address this potential dilemma is to restrict energy efficiency projects to only those that reduce or avoid *on-site* combustion of fossil fuels.

[21] A GWP is an index of how much a GHG may, by its potency and quantity, contribute to global warming over a period of time, typically 100 years. GWPs are used to compare a gas's potency relative to carbon dioxide, which has a GWP of 1. For example, methane's GWP is 25, and is thus a more potent GHG than carbon dioxide by a factor of 25. The GWPs listed in this report are from: Intergovernmental Panel on Climate Change, 2007, *Climate Change 2007: The Physical Science Basis*, p. 212.

[22] Of the CERs expected to be issued by 2012, the percentage drops to 22% (still the highest percentage by offset type). (continued...)

primarily used in the compliance market (i.e., nations complying with the Kyoto Protocol or other emission reduction obligations), the concerns highlighted by this offset type could apply to the voluntary market as well.[23]

Of the offset types certified through the Kyoto Protocol's Clean Development Mechanism (CDM), HFC-23 offsets represent the greatest percentage: 50% of the certified emission reductions (CERs)[24] have come from HFC-23 projects. Before the formation of the carbon offset market, facilities in the developing world, which produce about half of all HCFC-22, vented the by-product (HFC-23) to the atmosphere.[25] With the carbon market in play, facilities can generate offsets by capturing the HFC-23 emissions. Controversy has arisen, because the HCFC-22 production facilities can potentially earn more money from the offsets (destroying HFC-23 emissions) than from selling the primary material (HCFC-22).[26] This creates the perverse incentive to produce artificially high amounts of product, in order to generate the more lucrative by-product.

## Supplementarity

This issue is perhaps more relevant within the context of a mandatory GHG reduction program, but it may have an analogous application in a voluntary offset market. The Kyoto Protocol states that emissions credits (or carbon offsets) must be "*supplemental* to domestic actions for the purpose of meeting quantified emission limitations and reduction commitments...." (emphasis added).[27] Proponents of supplementarity argue that carbon offsets are a means of escaping or postponing real reductions.

This concept could also apply in the context of voluntary GHG reduction. Advocates of supplementarity may argue that if parties (individuals or companies) want to achieve carbon neutrality, parties should focus primarily on reducing their own emission-generating actions—e.g., travel, vehicle choice, size of home or office, etc—instead of looking to counterbalance the emissions from lifestyle choices through the purchase of offsets.[28]



(...continued)

See the United Nations Environment Programme (UNEP) Risoe Centre CDM Pipeline data, at http://cdmpipeline.org/index.htm.

[23] Moreover, HFC-23 offsets may be in the voluntary market. There is no system or registry in place to track the exchanges in the voluntary market.

[24] Regulated facilities can use CERs to meet compliance requirements under Kyoto or the European Union's Emission Trading Scheme.

[25] By comparison, major producers in the developed world continue to voluntarily capture and destroy HFC-23. See Michael Wara, 2006, *Measuring the Clean Development Mechanism's Performance and Potential*, Working Paper #56, Stanford Center for Environmental Science and Policy.

[26] This calculus depends on the market price for carbon offsets. See Michael Wara, 2006, *Measuring the Clean Development Mechanism's Performance and Potential*, Working Paper #56, Stanford Center for Environmental Science and Policy.

[27] Article 17, Kyoto Protocol.

[28] Taking this argument a step further, some have compared carbon offsets to indulgences that were sold during medieval times: i.e., purchasing offsets helps to assuage the guilt associated with carbon-intensive activities or lifestyles. See e.g., Kevin Smith, 2007, *The Carbon Neutral Myth*, Carbon Trade Watch, at http://www.carbontradewatch.org/pubs/carbon_neutral_myth.pdf.

## Assessment of Carbon Offset Sellers

At least 30 companies and organizations sell carbon offsets to individuals or groups in the international, voluntary carbon market. The quality of the offsets may vary considerably, largely because there are no commonly accepted standards. Some offset sellers offer offsets that comply with standards that are generally regarded as the most stringent: e.g., the Clean Development Mechanism[29] or the Gold Standard.[30] These standards generally have a robust test for additionality, as well as more substantial monitoring and verification procedures. As such, offsets meeting these standards incur higher transaction costs, adding to the cost per ton of carbon.

Some offset sellers offer offsets that meet the seller's self-established guidelines. These self-established protocols can vary considerably, raising questions of integrity. Are the protocols addressing additionality concerns? Are the offsets accounted in such a way as to avoid double-counting? Are the offset projects verified by independent third parties? Assessing the standards can be challenging for a consumer. Moreover, some company's standards are not made public, but may be considered proprietary information.[31]

Two recent studies have examined approximately 30 companies and/or groups that sell carbon offsets on the voluntary market.[32] The following list highlights findings from the analyses:

- The prices for carbon offsets range between $5 and $25 per ton of carbon.
- Offset prices show a correlation with offset quality.
- Overhead costs can vary substantially by seller. However, this factor may not be a good indicator of offset quality.[33]
- The tax status of a seller (profit firm vs. non-profit group) was not a good indicator of offset quality.

Arguably, the most significant finding of the two studies is the general correlation between offset price and offset quality. This correlation is more striking, considering the range of offset prices ($5 to $25 per ton of carbon reduced).



[29] The Clean Development Mechanism (CDM) was developed under the Kyoto Protocol. Projects are assessed on an individual basis and must be approved by an Executive Board. An independent third-party verifies the projects emission reductions. For more information, see http://unfccc.int/kyoto_protocol/items/2830.

[30] The Gold Standard was developed by a group of non-governmental organizations. The Gold Standard sets requirements beyond the CDM, but only applies to renewable and energy efficiency projects. See http://www.cdmgoldstandard.org.

[31] For example, one report found it difficult to evaluate certain offset marketers, because the offset certification and verification process was deemed proprietary. See Anja Kollmuss and Benjamin Bowell, 2007, *Voluntary Offsets For Air-Travel Carbon Emissions Evaluations and Recommendations of Voluntary Offset Companies*, Tufts Climate Initiative, Revised April 5, 2007.

[32] Ibid; Clean Air-Cool Planet, 2006, *A Consumer's Guide to Retail Carbon Offset Providers*, prepared by Trexler Climate + Energy Services ("Trexler Report").

[33] The Trexler report stated that low overhead costs may indicate that only minimal time was spent evaluating the quality of the project.

## Congressional Activity

Several bills in the 110th Congress have the potential to impact the voluntary carbon offset market:

- 2007 "Farm Bill": Both the House-passed bill (H.R. 2419, H.Rept. 110-256) and the Senate Agriculture Committee-approved (bill number forthcoming) versions include provisions that would facilitate the development of private-sector market-based approaches for a range of environmental goods and services (e.g., water and air quality, carbon storage, habitat protection, etc.) involving the agriculture and forestry sectors. The House version would, among other things, establish an Environmental Services Standards Board chaired by the U.S. Department of Agriculture (USDA) that would provide grants and a framework to develop consistent standards and processes for quantifying offsets from the farm and forestry sectors. The Senate version differs in approach but also directs USDA to develop a framework to develop standards and procedures; however, the Senate bill requires the initial focus to be on carbon markets.[34]
- H.R. 823 (Welch): Introduced February 5, 2007, this bill would authorize federal agencies to purchase offsets or renewable energy credits, and direct the Department of Energy to certify whether the offsets are eligible, based on rules developed by the Department.

## Conclusions

Carbon offset purchases are intended to generate emission reductions that would not have occurred otherwise. In terms of global climate change mitigation, an emission reduction, avoidance, or sequestration is beneficial regardless of where or how it occurs. For example, a ton of carbon reduced at a power plant will have the same atmospheric effect as a ton of carbon reduced, avoided, or sequestered through an offset project.

The core issue for carbon offset projects is: do they actually *offset* emissions generated elsewhere? If the credibility of the voluntary offsets is uncertain, claims of carbon neutrality may lack merit. Evidence suggests that not all offset projects are of equal quality, because they are developed through a range of standards. Although some standards are considered stringent, others are less so. In some cases, the standards used are not even made available to the purchaser. Due to the lack of common standards, some observers have referred to the current voluntary market as the "wild west." This does not suggest that all carbon offsets are low quality, but that the consumer is forced to adopt a buyer-beware mentality when purchasing carbon offsets. This places the responsibility on consumers to judge the quality of carbon offsets.

The voluntary carbon offset market raises several issues that Congress may consider. The viability—both actual and perceived—of the offset market may influence future policy decisions regarding climate change. For instance, some people are concerned that the range in the quality of voluntary market offsets may damage the overall credibility of carbon offsets.[35] If this occurs, it

[34] For more on this aspect of the legislation see CRS Report RL34042, *Environmental Services Markets: Farm Bill Proposals*, by Renee Johnson.

[35] See Trexler, Mark, and Kosloff, Laura, 2006, "Selling Carbon Neutrality," *Environmental Forum*, March/April 2006; and Hayes, David J., 2007, "Bring the U.S. into the Global Carbon Market," *The Environmental Forum*, Vol.24, no. 4 (continued...)

may affect policy decisions concerning whether or not to include offsets as an option in a mandatory reduction program. This is an important policy question for Congress. Although some oppose the use of offsets based on supplementarity concerns (see discussion above), other argue that credible offsets would expand the compliance alternatives and likely lower the costs of a GHG emissions reduction program.[36]

The voluntary program may inform the climate change policy debate in another manner. If Congress were to enact a federal GHG emissions control program that included the use of offsets, all of the integrity concerns—e.g., additionality, permanence, accounting—would need to be addressed in some fashion. The experiences gained in the voluntary market may help policymakers develop standards or a process by which the integrity of offset projects could be assessed.

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(...continued)

(March/April 2007).

[36] Both the Environmental Protection Agency (EPA) and the Energy Information Administration (EIA) analyzed the costs associated with S. 280 (a cap-and-trade proposal that would allow the use of offsets). See, U.S. EPA, 2007, *EPA Analysis of The Climate Stewardship and Innovation Act of 2007*; and EIA, 2007, *Energy Market and Economic Impacts of S. 280, the Climate Stewardship and Innovation Act of 2007*.