United States Government Accountability Office

GAO

Testimony

Before the Subcommittee on Energy and Environment, Committee on Energy and Commerce, House of Representatives

For Release on Delivery
Expected at 9:30 a.m. EST
Thursday, March 5, 2009

CLIMATE CHANGE

Observations on the Potential Role of Carbon Offsets in Climate Change Legislation

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Natural Resources & Environment

March 5, 2009

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Highlights

Highlights of GAO-09-456T, a testimony before the Subcommittee on Energy and Environment, Committee on Energy and Commerce, House of Representatives

Why GAO Did This Study

Carbon offsets—reductions of greenhouse gas emissions from an activity in one place to compensate for emissions elsewhere—can reduce the cost of regulatory programs to limit emissions because the cost of creating an offset may be less than the cost of requiring entities to make the reductions themselves. To be credible, however, an offset must be additional—it must reduce emissions below the quantity emitted in a business-as-usual scenario—among other criteria.

In the U.S., there are no federal requirements to limit emissions and offsets may be purchased in a voluntary market. Outside the U.S., offsets may be purchased on compliance markets to meet requirements to reduce emissions. The Congress is considering adopting a market-based cap-and-trade program to limit greenhouse gas emissions. Such a program would create a price on emissions based on the supply and demand for allowances to emit. Under such a program, regulated entities could potentially substitute offsets for on-site emissions reductions, thereby lowering their compliance costs.

Today's testimony summarizes GAO's prior work examining (1) the challenges in ensuring the quality of carbon offsets in the voluntary market, (2) the effects of and lessons learned from the Clean Development Mechanism (CDM), an international offset program, and (3) matters that the Congress may wish to consider when developing regulatory programs to limit emissions.

View GAO-09-456T or key components.
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What GAO Found

In an August 2008 report, GAO identified four primary challenges related to the United States voluntary carbon offset market. First, the concept of a carbon offset is complicated because offsets can involve different activities, definitions, greenhouse gases, and timeframes for measurement. Second, ensuring the credibility of offsets is challenging because there are many ways to determine whether a project is additional to a business-as-usual baseline, and inherent uncertainty exists in measuring emissions reductions relative to such a baseline. Related to this, the use of multiple quality assurance mechanisms with varying requirements may raise questions about whether offsets are fully fungible—interchangeable and of comparable quality. Third, including offsets in regulatory programs to limit greenhouse gas emissions could result in environmental and economic tradeoffs. For example offsets could lower the cost of complying with an emissions reduction policy, but this may delay on-site reductions by regulated entities. Fourth, offsets could compromise the environmental certainty of a regulatory program if offsets used for compliance lack credibility.

In a November 2008 report, GAO examined the environmental and economic effects of the CDM—an international program allowing certain industrialized nations to pay for offset projects in developing countries—and identified lessons learned about the role of carbon offsets in programs to limit emissions. While the CDM has provided cost containment in a mandatory emissions reduction program, its effects on emissions are uncertain, largely because it is nearly impossible to determine the level of emissions that would have occurred in the absence of each project. Although a rigorous review process seeks to ensure the credibility of projects, available evidence from those with experience in the program suggests that some offset projects were not additional. In addition, the project approval process is lengthy and resource intensive, which significantly limits the scale and cost-effectiveness of emissions reductions.

The findings from these two reports illustrate how challenges in the voluntary offset market and the use of offsets for compliance—even in a rigorous, standardized process like the CDM—may compromise the environmental integrity of mandatory programs to limit emissions and should be carefully evaluated. As a result of these challenges, GAO suggested that, as it considers legislation that allows the use of offsets for compliance, the Congress may wish to consider, among other things, directing the establishment of clear rules about the types of projects that regulated entities can use as offsets, as well as procedures to account and compensate for the inherent uncertainty associated with offset projects. Further, GAO suggested that the Congress consider key lessons from the CDM, including the possibility that, (1) due to the tradeoffs involving cost savings and the credibility of offsets, their use in mandatory programs may be, at best, a temporary solution to achieving emissions reductions, and (2) the program's approval process may not be a cost-effective model for achieving emission reductions.

Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to provide observations and matters for congressional consideration on the potential role of carbon offsets in climate change legislation drawn from two of our previously issued reports.[1] As the Congress and this Subcommittee consider legislation to limit greenhouse gas emissions, the potential role of carbon offsets—reductions or avoidances of greenhouse gas emissions from an activity in one place to compensate for emissions occurring elsewhere—is a critical issue that could influence the economic and environmental outcomes achieved through climate change legislation. Carbon offsets can be an important cost-containment mechanism in policies to limit greenhouse gas emissions because the cost of creating an offset may be less than the cost of requiring regulated entities to make the reductions themselves. However, ensuring the credibility of carbon offsets poses challenges because of the inherent uncertainty in measuring emissions reductions relative to a projected business-as-usual scenario.

In recent years, major scientific bodies such as the Intergovernmental Panel on Climate Change and the National Academy of Sciences have concluded that human activities, including the combustion of fossil fuels, industrial and agriculture processes, landfills, and some land use changes, are significantly increasing the concentrations of greenhouse gases in the atmosphere and, in turn, global temperatures. Specifically, these activities have increased the amount of carbon dioxide and other greenhouse gases—including methane, nitrous oxide, and several synthetic gases—in the atmosphere. This warming will cause significant changes in sea level, ecosystems, and ice cover, among other impacts. In recent years, key scientific assessments have underscored the importance of reducing or stabilizing emissions of greenhouse gases to mitigate the adverse effects of climate change.

Most of the efforts to limit greenhouse gas emissions under consideration in the United States generally focus on market-based programs—such as a cap-and-trade system or a tax—that would create a price on greenhouse gas emissions. In general, under a cap-and-trade program, the government

[1]GAO, *Carbon Offsets: The U.S. Voluntary Market is Growing, but Quality Assurance Poses Challenges for Market Participants*, GAO-08-1048 (Washington, D.C.: Aug. 29, 2008), and GAO, International Climate Change Programs: *Lessons Learned from the European Union's Emissions Trading Scheme and the Kyoto Protocol's Clean Development Mechanism*, GAO-09-151 (Washington, D.C.: Nov. 18, 2008).

would limit the overall amount of greenhouse gas emissions from regulated entities. These entities would need to hold allowances for their emissions, and each allowance would entitle them to emit a specific amount of a greenhouse gas. Under such a program, the government could sell the allowances, give them away, or some combination of the two. Regulated entities that find ways to reduce their emissions to below their allowed limit could sell their excess allowances to regulated entities that emit more than their limits, effectively creating a market for allowance trading and establishing a price for a ton of emissions based on supply and demand. A cap-and-trade system could allow regulated entities to purchase offsets in lieu of purchasing additional allowance or reducing emissions themselves.

Currently, carbon offsets are generated, bought, and sold in two types of markets. In markets such as the United States, which does not have binding limits on emissions, the market is referred to as a voluntary market. Conversely, in the European Union's Emissions Trading Scheme (EU ETS), a program to limit emissions of carbon dioxide from certain industry sectors, the market is referred to as a compliance market because regulated entities can use a limited number of carbon offsets to meet their regulatory limits on emissions. Under the EU ETS, regulated entities use offsets generated through the Clean Development Mechanism (CDM), a program under the Kyoto Protocol that allows countries with binding limits on emissions to implement projects that reduce or avoid emissions in a developing country that does not have a binding target under the Protocol. CDM projects earn credits, each equivalent to 1 metric ton of carbon dioxide that an industrialized country sponsoring the project can sell or use for compliance with targets under the Protocol. These credits are known as Certified Emissions Reductions (CERs). The United States has not ratified the Kyoto Protocol and is therefore not a source or purchaser of CERs.

My testimony today draws observations from two previously issued GAO reports that characterized the U.S. voluntary carbon offset market and identified lessons learned from international climate change programs, including the CDM. Specifically, this testimony summarizes our prior work related to (1) challenges in ensuring the quality of offsets in the voluntary market, (2) the effects of and lessons learned from the Kyoto Protocol's CDM, and (3) matters for congressional consideration included in those reports that may merit consideration in the development of climate change policy.

Our work related to voluntary offset market is based on analysis of literature and data and interviews with stakeholders, including offset providers, third party verifiers, and other participants in the voluntary market. To identify the lessons learned from the CDM, we worked with the National Academy of Sciences to recruit 26 experts based on their experience and expertise with international climate change programs and their knowledge of the U.S. policy development process. We gathered the experts' opinions through a questionnaire, interviewed stakeholders, and reviewed available information. We conducted our work in accordance with GAO's Quality Assurance Framework, which requires that we plan and perform each engagement to obtain sufficient and appropriate evidence to meet our stated objectives and to discuss any limitations in our work. We believe that the information and data obtained, and the analyses conducted, provided a reasonable basis for the findings and conclusions in these reports.

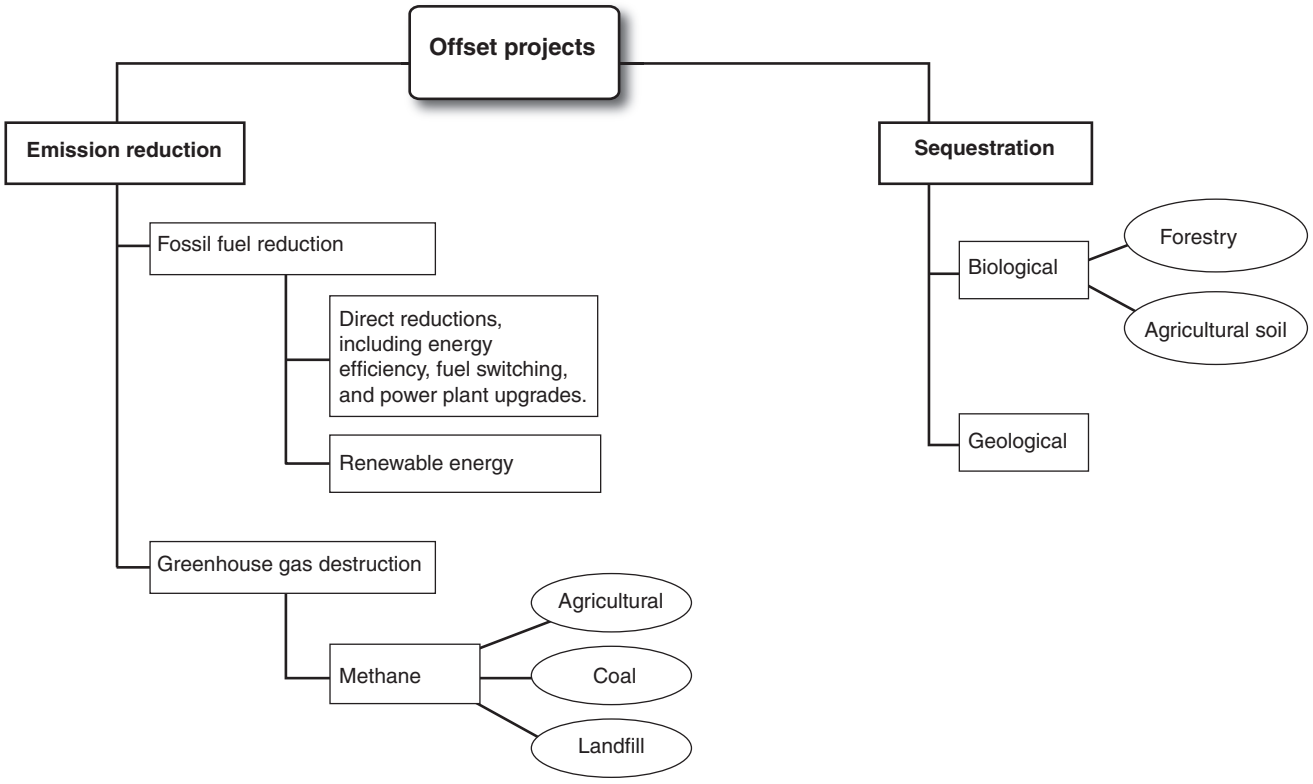
Ensuring the Credibility of Carbon Offsets Poses Challenges in the U.S. Voluntary Market

Our August 2008 report identified four primary challenges with the U.S. voluntary market.[2] First, the concept of a carbon offset is complicated because offsets can involve different activities, definitions, greenhouse gases, and timeframes for measurement. While most markets involve tangible goods or services, the carbon offset market involves a product that represents the absence of something—in this case, an offset equals the absence of one ton of carbon dioxide emissions or the equivalent quantity of another greenhouse gas.

Project developers produce offsets from a variety of activities such as sequestration in agricultural soil and forestry projects, and methane capture. Specifically, carbon offsets can result from three broad types of activities: (1) reductions of greenhouse gases, which may include activities such as the capture of methane from landfills or coalmines, (2) avoidance of greenhouse gases, which may include activities such as the development of renewable energy infrastructure, and (3) sequestration, which may involve storing carbon dioxide in geologic formations or planting trees that take carbon dioxide out of the atmosphere. See figure 1 for a diagram of common types of carbon offset projects.

[2]GAO, *Carbon Offsets: The U.S. Voluntary Market is Growing, but Quality Assurance Poses Challenges for Market Participants*, GAO-08-1048 (Washington, D.C.: Aug. 29, 2008).

Figure 1: Common Offset Project Types



Source: GAO based on Ricardo Bayon, Amanda Hawn, and Katherine Hamilton, *Voluntary Carbon Markets*, (Sterling, Virginia: Earthscan).

An additional complication is that the parties involved in generating, buying, and selling offsets may also use different definitions of a carbon offset. The term is often used generically to describe reductions or avoidances of emissions of any or all of the six primary greenhouse gases. Furthermore, these six gases vary in their potency or climate forcing effect, referred to as global warming potential. See table 1 for a description of U.S. greenhouse gas emissions and global warming potential. Scientists have developed a concept known as carbon equivalence that takes these variations into account and provides a way to describe emissions of different gases in comparable terms. For example, methane is roughly equivalent in global warming potential to about twenty one tons of carbon dioxide, the most common greenhouse gas.

Table 1: Shares and Global Warming Potentials of Greenhouse Gas Emissions from U.S. Sources, 2006

Greenhouse gas	Major sources	Percentage of total U.S. greenhouse gas emissions	Global warming potential
Carbon dioxide	Fossil fuel combustion, nonenergy use of fuels, and iron and steel production	85%	1
Methane	Landfills, natural gas and petroleum systems, agriculture, and coal mining	8	21
Nitrous oxide	Agricultural soil management, transportation, and manure management	5	310
Synthetic gases (HFCs, PFCs, and SF6)[a]	Substitution of ozone-depleting substances, electric power transmission and distribution, and aluminum production	2	140 to 23,900

Source: Environmental Protection Agency

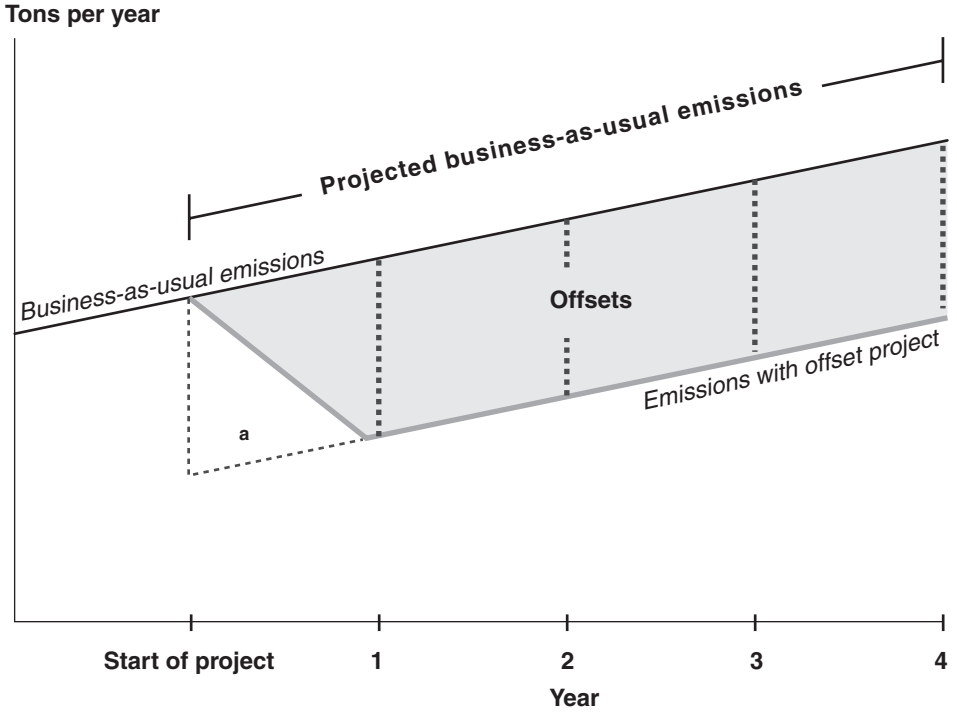
[a]HFCs (hydrofluorocarbons), PFCs (perfluorocarbons), SF6 (sulfur hexafluoride)

Finally, the timing of an offset's creation is complicated. In cases where offsets are sold before they are produced, the quantity of offsets generated from projects can be calculated using what is known as ex-ante (or future value) accounting. On the other hand, when offsets are sold after they are produced, the quantity of offsets can be calculated using ex-post accounting. Using future value accounting, consumers may purchase an offset today, but it may take several years before the offset is generated. Ensuring the credibility of offsets purchased before they are produced inherently involves a higher degree of uncertainty than purchasing an offset that has already been generated.

The second challenge is ensuring the credibility of offsets. Our prior work identified four general criteria for credible carbon offsets—they must be additional, quantifiable, real, and permanent. A carbon offset project is generally considered "additional" if it decreases emissions of greenhouse gases below the quantity that would have been emitted in a projected business-as-usual scenario. "Quantifiable" means the reductions can be measured, and "real" means the reductions can be verified. "Permanent" means the emissions reduced, avoided, or sequestered by a project will not be released into the atmosphere in the future.

Providing assurance that offsets are credible is inherently challenging because it involves measuring the reductions achieved through an offset project against a projected baseline of what would have occurred in its absence. For example, if a facility that emitted 200 tons of carbon dioxide per year implemented a project that reduced its emissions by 100 tons, it may have created 100 tons of offsets. See figure 2 for a hypothetical depiction of an offset project measured against a projected business-as-usual scenario.

Figure 2: Hypothetical Depiction of Offset Project Measured against Business-as-Usual Scenario



Source: GAO.

Our prior work found that additionality is fundamental to the credibility of offsets because only offsets that are additional to business-as-usual activities result in new environmental benefits. Several stakeholders we interviewed as part of our study said that there is no correct technique for determining additionality because it requires comparison of expected reductions against a projected business-as-usual emissions baseline. Determining additionality is inherently uncertain because, it may not be possible to know what would have happened in the future had the projects

not been undertaken. There are many ways to estimate whether projects are additional, and many stakeholders said that applying a single test is too simplistic because every project is different from others and operates under different circumstances.

There are many quality assurance mechanisms, commonly described collectively as "standards," for assuring the credibility of carbon offsets in the U.S. voluntary market, but few standards, if any, that cover the entire supply chain. The proliferation of standards has caused confusion in the market, and the existence of multiple quality assurance mechanisms with different requirements raises questions about the quality of offsets available on the voluntary market, according to many stakeholders. The lack of standardization in the U.S. market may also make it difficult for consumers to determine whether offsets are fully fungible—interchangeable and of comparable quality—a characteristic of an efficient commodity market. The term "carbon offset" implies a uniform commodity, but offsets may originate from a wide variety of project types based on different quantification and quality assurance mechanisms. Because offsets are not all the same, it may be difficult for consumers to understand what they purchase.

While the concept of carbon offsets rests on the notion that a ton of carbon reduced, avoided, or sequestered is the same regardless of the activity that generated the offset, some stakeholders believe that certain types of projects are more credible than others. Specifically, the stakeholders identified methane capture and fuel-switching projects as the most credible, and renewable energy certificates (REC) and agricultural and rangeland soil carbon sequestration as less credible.[3] The stakeholders' views on the credibility of different project types may stem from the fact that methane and fuel-switching projects are relatively simple to measure and verify, while other projects such as RECs, forestry, and agricultural and rangeland soil carbon projects face challenges related to additionality, measurement, and permanence. With respect to agricultural and rangeland sequestration and forestry, certain stakeholders said it is difficult to accurately measure emissions reductions from these types of projects. In addition, forestry offset projects may not be permanent because disturbances such as insect outbreaks and fire can return stored carbon to the atmosphere.

[3]Renewable energy certificates certify that a certain quantity of electricity has been generated from a qualifying type of renewable generation technology.

Third, there are economic and environmental tradeoffs associated with using offsets in a regulatory program to limit greenhouse gas emissions. In many cases, regulated entities may find it economically advantageous to buy offsets instead of reducing emissions themselves. The Environmental Protection Agency (EPA) has stated that the cost of compliance with mitigation policies under consideration by the Congress decreases substantially as the use of offsets increases. Specifically, EPA's analysis of the Climate Security Act of 2008 (S. 2191), introduced in the last Congress, reported that if the use of domestic and international offsets is unlimited, then compliance costs fall by an estimated 71 percent compared to the bill as written. Alternatively, the price increases by an estimated 93 percent compared to the bill as written if no offsets are allowed. Other studies show similar results. In general, the carbon price is lower in quantitative models of a U.S. compliance system when domestic and international offsets are widely available and their use is unrestricted. In the short term, lower prices make compliance with a policy to reduce emissions less expensive.

Multiple stakeholders we interviewed as part of our study said that including offsets in a compliance scheme could slow investment in certain emissions reduction technologies in regulated sectors and lessen the motivation of market participants to reduce their own emissions. According to some stakeholders, if more cost-effective offsets are available as compliance tools, regulated sources may delay making investments to reduce emissions internally, an outcome that could ultimately slow the development of, and transition to, a less carbon-intensive economy.

Fourth, allowing the use of offsets could compromise the environmental certainty of a regulatory program to limit emissions of greenhouse gases if the offsets do not meet requirements that underpin their integrity. If a significant number of nonadditional offsets enter the market, emissions may rise beyond levels intended by the scheme, according to some stakeholders. Nonadditional offsets could thus increase uncertainty about achieving emissions reduction goals. This concern underscores the importance of using quality assurance mechanisms to ensure the credibility of any offsets allowed into a compliance scheme. Using offsets in a compliance scheme could also increase administrative costs because of increased government oversight of quality assurance mechanisms used to ensure the credibility of offsets.

Concerns associated with using offsets for compliance in a regulatory system to limit emissions could be minimized by restricting the use of

offsets or including policy options for enhancing oversight of the market such as applying discounts or imposing insurance requirements on offsets with greater uncertainty or potential for failure. Certain stakeholders suggested imposing limits on the use of offsets in a compliance scheme to address some of these challenges, but stakeholders held different opinions about the potential effectiveness of this approach. Some said it may be necessary to place restrictions on the use of offsets in order to achieve internal emissions reductions from regulated sources. If all the effort to reduce emissions is in the form of offsets, then the compliance system may not provide the price signals necessary for long-term investment in technology at domestic industrial facilities and power plants, according to multiple stakeholders. They said that domestic abatement is central to achieving the long-term goal of any emissions reduction system. However, other stakeholders said that incorporating offsets into a compliance scheme will enable greater overall climate benefits to be achieved at a lower cost, as long as offsets are additional and are not double-counted.

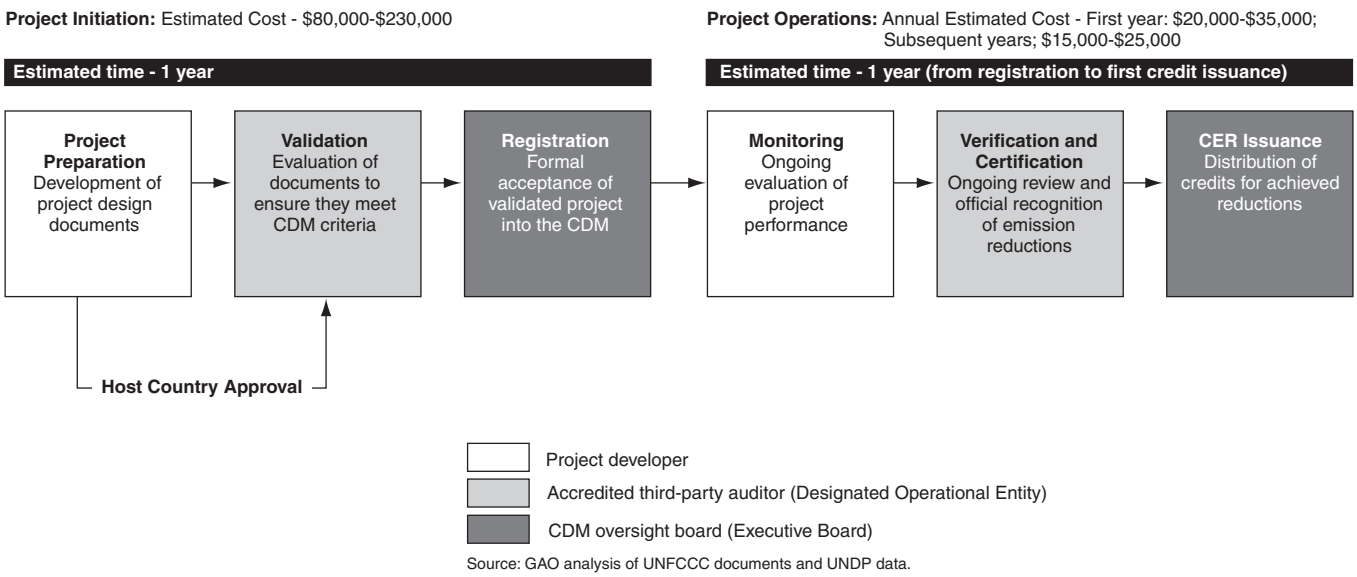
The CDM's Environmental and Economic Effects Provide Important Lessons About the Role of Carbon Offsets in Mandatory Programs to Limit Emissions

Our November 2008 report discussed the environmental and economic effects of the CDM and identified lessons learned about the role of carbon offsets in mandatory programs to limit emissions.[4] First, with respect to environmental effects, the overall effect of the CDM on international emissions is uncertain, largely because it is nearly impossible to determine the level of emissions that would have occurred in the absence of each offset project. The CDM imposes a rigorous set of review requirements for applicants to complete before obtaining project credits, known as Certified Emissions Reductions (CERs), which can be sold or used for compliance with targets under the Kyoto Protocol. Applicants must demonstrate, among other things, that the project would not have occurred without the CDM and to obtain approval of the Executive Board,

[4]See GAO, *International Climate Change Programs: Lessons Learned from the European Union's Emissions Trading Scheme and the Kyoto Protocol's Clean Development Mechanism*, GAO-09-151 (Washington, D.C.: Nov. 18, 2008).

a regulatory body established by the Kyoto Protocol.[5] See figure 3 for the resources and time associated with each step in the review process.

Figure 3: CDM Project Cycle



Source: GAO analysis of UNFCCC documents and UNDP data.

This resource- and time-intensive process, however, has involved challenges. While the CDM project review process may provide greater assurance of credible projects, available evidence suggests that some credits have been issued for emission reduction projects that were not additional. Because additionality is based on projections of what would have occurred in the absence of the CDM, which are necessarily hypothetical, it is impossible to know with certainty whether any given project is additional. Researchers have reported that some portion of projects registered under the CDM have not been additional, and although

[5]Applicants seeking CDM credits must demonstrate the proposed projects are additional—i.e., that the project would not have occurred without the CDM due to technological, economic, or other barriers. As part of this demonstration, applicants estimate the reductions achieved by the project using a projected business-as-usual baseline. An external party must validate documentation and verify emission reductions. In addition to Executive Board approval, projects must undergo review by national officials of the country where the project occurs before credits are issued. Once approved, emissions from each project are monitored periodically in accordance with procedures outlined in the initial project proposal. Credits are issued only for emission reductions that have been verified by a separate, independent auditing firm.

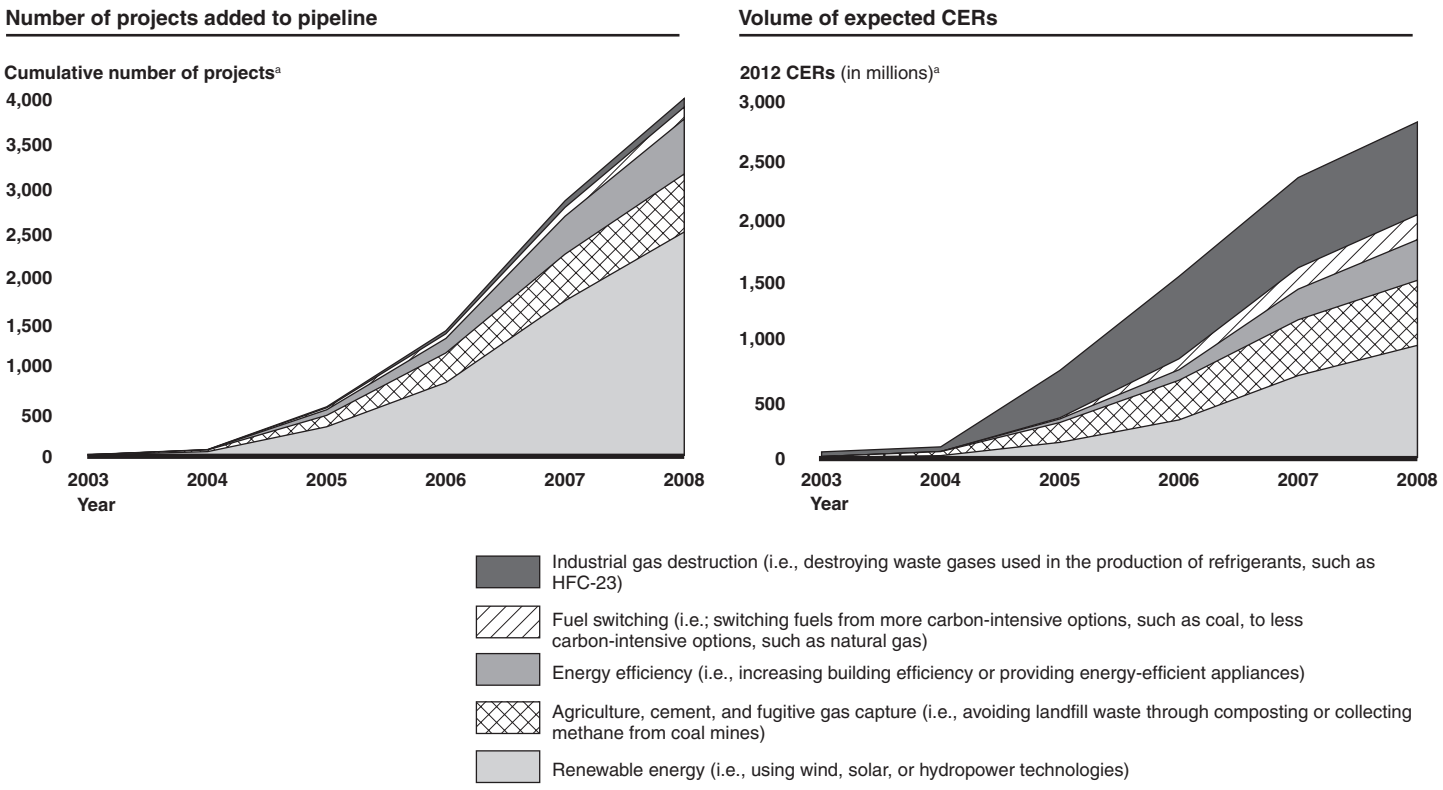
there is little empirical evidence to support a precise figure, some studies have concluded that a substantial number of nonadditional projects have received credits.[6]

Second, with respect to economic effects, specifically opportunities for cost-effective reductions, available information and experts indicate that the CDM has enabled industrialized countries to make progress toward achieving their emissions targets at less cost and has involved developing countries in these efforts. For example, facilities covered under the European Union's Emissions Trading Scheme (ETS) may invest in CERs as a lower-cost alternative to reducing emissions on-site or purchasing allowances under the ETS.[7] Further, the availability of CERs may produce lower allowance prices than would be observed under a no-offset scenario. As a result, the CDM can potentially reduce firms' compliance costs regardless of whether these firms choose to purchase CERs. See figure 4 for information about the number and types of offset projects in CDM pipeline. The first chart in figure 4 shows the most common types of projects and their growth over time while the second chart shows the volume of credits expected to be produced through 2012.

[6]See, for example, Schneider, Lambert, *Is the CDM fulfilling it environmental and sustainable development objectives? An evaluation of the CDM and options for improvement* (Berlin, Germany, 2007).

[7]Covered entities in the ETS need to hold allowances for their emissions, and each allowance entitles them to emit a specific amount of carbon dioxide. Under the ETS, covered entities have been able to use certain CDM credits in addition to ETS allowances to cover their emissions.

Figure 4: CDM Pipeline



Source: GAO analysis of UNEP Risoe Center data (2008).

The demand for CERs has also provided developing countries that do not have emissions targets under the Kyoto Protocol with an economic incentive to pursue emission reduction activities. However, while CDM projects have been established in over 70 developing countries, most benefits have thus far accrued to fast-growing nations such as China and India. In fact, these two countries host over half of all registered projects. Conversely, countries in Africa and the Middle East have seen little CDM-related investment.

We also reported that investors in the CDM market face higher risks, depending on, for example, whether the rights to the CDM credits are

purchased prior to actual issuance of the credits.[8] Because the credits in this case are not issued until the project is completed and emissions are verified, there is some risk that the project will not produce the expected number of credits. For example, the CDM's Executive Board may delay or reject a project and even approved projects might not be built on schedule or within budget. Further, the amount of actual reductions may differ from what was planned—for example, wind energy projects may generate more or less electricity depending on weather conditions. One study shows that projects reaching the registration phase tended to yield only about 76 percent of their forecasted CDM credits.

Our review of the CDM experience, in particular using offsets in a compliance program, revealed that reducing compliance costs while maintaining overall environmental integrity can prove difficult. Using available information, stakeholder interviews, and our experts' responses to a questionnaire, we identified three key lessons learned about the use of offsets in programs to limit emissions.

First, the use of offsets can compromise the integrity of programs designed to reduce greenhouse gas emissions. In theory, if all offsets were real and additional, their use in a mandatory program to limit emissions shifts the location of the emission reductions and would not negatively affect the scheme's integrity. However, as many experts mentioned, it is nearly impossible to demonstrate project additionality with certainty. Because the CDM is primarily used by countries to comply with the Kyoto Protocol's binding targets and the ETS emissions caps, credits that do not represent real and additional emission reductions do not represent progress toward these targets or caps. If a significant number of nonadditional credits are allowed into the program, for instance, these credits may allow covered entities to increase their emissions without a corresponding reduction in a developing country. This can cause emissions levels to rise above the targets set by the program, introducing uncertainty as to the actual level of reductions, if any, achieved by the program. As a result, this use of nonadditional offsets negates one of the advantages—greater certainty about the level of emissions—of a cap-and-trade program compared to other market-based programs.

[8]Known as "primary CERs," these credits involve a higher level of uncertainty because most purchases involve forward contracts—the buyer purchases the rights to future credits instead of the credits themselves. See GAO-09-151 for more detailed discussion.

Some research has advocated limiting the use of offsets in compliance schemes as a way to reduce the environmental risk of nonadditional projects; however, our research shows that even restricted offset use can have broad environmental implications. In particular, the experience of the European Union's ETS illustrates the importance of considering offset limits in the context of a country's overall reduction effort, in addition to its overall emissions target. As noted previously, limiting offsets based on the overall emissions cap—for example, allowing countries to meet 12 percent of their emissions cap with offsets—may mean in practice that most or all reductions occur outside of that country's borders. If most reductions occur elsewhere, there may be little incentive for entities under the compliance program to make infrastructure changes or other technological investments. Furthermore, the negative environmental effects of nonadditional offsets increase as the number of imported credits rises. On the other hand, stringent limits can ensure that a certain portion of abatement activity occurs at home and help secure a carbon price that is high enough to spur investment in low-carbon technologies; limits also can lessen the impact of nonadditional credits. If limits are imposed, therefore, it is important that such limits are sufficiently stringent and are based on actual expected emission reductions, not the overall emissions cap.

Second, carbon offset programs involve important tradeoffs and the use of such programs may be, at best, a temporary solution to addressing climate change. While the CDM may encourage developing countries to participate in emission reduction activities, it also may increase their reliance on external funding for such activities. According to several experts, the CDM effectively deters efforts that fall outside the scope of creditable activities. Moreover, as many of our experts pointed out, the concept of additionality presents a difficult regulatory problem. Rigorous project reviews may help ensure some degree of credit quality, but also can increase the overall cost of the program. Overall, many experts suggested that the CDM has not yet achieved an effective balance of these priorities.

There is general consensus among climate change experts that both industrialized and developing countries must be engaged in emission reduction efforts to meet international emission reduction goals. In light of these circumstances, several experts we consulted noted that international offset programs such as the CDM can help to engage developing nations and encourage emission reductions in areas that may not otherwise have incentives to do so. Several experts also said that the CDM helps stimulate interest in international climate change dialogue and may help facilitate progress toward future emission reduction commitments.

Given these tradeoffs, some observers have said the best approach may be to gradually incorporate developing nations under a global emission reduction plan or move toward full-fledged, worldwide emission trading. However, political and institutional capacity may make worldwide emission trading an unlikely possibility. As a result, the CDM may be best used as a transition tool to help developing nations move toward a more comprehensive climate change strategy.

Third, the CDM's approval process may not be a cost-effective model for achieving emission reductions. Most experts expressed dissatisfaction with this approach, which requires individual review and additionality assessments for each project. Observers also have described the project-by-project approach as inefficient, noting that the long, uncertain process can create risks and costs for investors. Host country stakeholders we spoke with generally agreed with this assessment, saying that the process was bureaucratic and overly burdensome. Indeed, the length and administrative complexity of the process, as well as the shortage of available emission verifiers, has resulted in bottlenecks and delays as the CDM's administrative structure has struggled to keep up with the number of projects. Moreover, the transaction costs and investment risks associated with CDM projects can reduce their effectiveness as a cost-containment mechanism when linked to compliance schemes. While the CDM's intensive review process may help ensure some degree of environmental integrity, it also can limit the number of potential projects in the system. For example, the cost to initiate a CDM project and usher it through the approval process may be too high for certain projects, rendering them unviable.

The CDM's oversight board has taken a number of actions to help improve the process over time, but many experts said that the program does not yet provide a sufficient level of quality assurance. Also, it is unlikely under the current approach that the CDM will achieve large-scale reductions or significantly impact global emissions in the future. The scale of the CDM is limited not only by the extensive set of requirements; it also is constrained by the fundamental time and resource limitations of the 10-member Executive Board and its subsidiary panels, and the shortage of accredited auditing firms to validate projects and verify emissions. Even assuming all projects are real and additional, it is likely that reductions from these projects will only represent about 2 percent to 3 percent of annual energy-related carbon dioxide emissions in China and India, and less than 1

percent in Africa.[9] Finally, the design features of an offset program such as the CDM can be fine-tuned to help maximize their effectiveness, but the underlying challenges of determining additionality, for example, may not be eliminated completely.

While some of the experts who participated on our panel said that offset programs on their own are unlikely to be sufficient to help curb developing country emissions, others stated that reforming or supplementing the CDM could make a broader impact worldwide. Experts provided a number of potential improvements to the CDM, many of which would represent fundamental changes to the current mechanism's structure and procedures. For example, moving toward a sectoral approach under the CDM would involve crediting emission reductions in relation to baselines set for different economic sectors, such as a benchmark based on the best available technology for the industry, rather than making a project-specific determination of additionality. A sectoral approach would eliminate the need for project-specific determination of additionality, because credits are awarded based on performance in relation to a predetermined baseline. However, this approach requires reliable historic emissions data to set baselines and the technical capacity to monitor emissions, requirements which may prove problematic for some developing countries.

In addition, a few experts recommended discounting CDM credits. For example, with a discount rate of 30 percent, a project that is expected to reduce carbon dioxide by 100 metric tons would only receive 70 credits. While discounting may not help screen out nonadditional projects, it can help mitigate the environmental consequences of nonadditional credits. Our November 2008 report discusses these and other alternatives to the CDM in greater detail.[10]

[9]Analysis uses country-specific emissions data from IEA, Key World Energy Statistics (2008) as well as data on expected CERs from the UNEP Risoe CDM/JI Pipeline Analysis and Database, Oct. 1, 2008. IEA data for each region are based on 2006 indicators and include emissions from fuel combustion only.

[10]See GAO-09-151.

GAO's Reviews of Carbon Offset Markets Have Identified Matters for Congressional Consideration in Developing Climate Change Legislation

Our reports on two different markets for carbon offsets—the U.S. voluntary market and the CDM under the Kyoto protocol—have identified matters for the Congress to consider as it deliberates legislation to limit greenhouse gas emissions. While carbon offsets have the potential to lower compliance costs for entities that could be affected by regulatory limits on emissions, their use for compliance in a mandatory emissions reduction scheme could undermine the program's integrity if the offsets lack credibility.

Our report on the voluntary market for offsets in the United States highlights the complexity and challenges with a largely unregulated market that lacks transparency and provides market participants with limited information on the credibility of offsets. Alternatively, our work on CDM identifies challenges with using carbon offsets in a mandatory emissions reduction program despite the use of rigorous quality assurance procedures. The experience with both markets demonstrates the importance of ensuring the credibility of offsets, but this remains a challenge for both markets because of the inherent uncertainty associated with estimating emissions reductions relative to projected business-as-usual baselines. Using offsets in a mandatory emissions reduction program would involve fundamental trade-offs between offset credibility and compliance costs.

As we have reported, to the extent that the Congress chooses to develop a program that limits greenhouse gas emissions while allowing the use of carbon offsets for compliance, it may wish to establish (1) clear rules about the types of offset projects that regulated entities can use for compliance, as well as standardized quality assurance mechanisms for these allowable project types; (2) procedures to account and compensate for the inherent uncertainty associated with offset projects, such as discounting or overall limits on the use of offsets for compliance; (3) a standardized registry for tracking the creation and ownership of offsets; and (4) procedures for amending the offset rules, quality assurance mechanisms, and registry, as necessary, based on experience and the availability of new information over time.

In addition, our report on international carbon offset programs generated matters for consideration that may prove useful if the Congress looks to the CDM as a model for an offset program. Specifically, Congress may wish to consider that (1) the existing program may not be the most direct or cost-effective means of achieving reductions in emissions, (2) the use of carbon offsets in a cap-and-trade system can undermine the system's integrity, given that it is not possible to ensure that every credit represents

a real, measurable, and long-term reduction in emissions; and (3) while proposed reforms may significantly improve the CDM's effectiveness, carbon offsets involve fundamental tradeoffs and may not be a reliable long-term approach to climate change mitigation.

Contact and Staff Acknowledgments

Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. For further information about this testimony, please contact John Stephenson, Director, Natural Resources and Environment at (202) 512-3941 or stephensonj@gao.gov. Key contributors to this statement were Michael Hix (Assistant Director), Kate Cardamone, Janice Ceperich, Jessica Lemke, Alison O'Neill, and Joe Thompson. Cindy Gilbert, Anne Johnson, Richard P. Johnson, Ardith A. Spence, and Lisa Vojta also made important contributions.

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