

August 2008

CARBON OFFSETS

The U.S. Voluntary Market Is Growing, but Quality Assurance Poses Challenges for Market Participants

**This Report Is Temporarily Restricted Pending
Official Public Release.**





Highlights of [GAO-08-1048](#), a report to congressional requesters

Why GAO Did This Study

Carbon offsets—reductions of greenhouse gas emissions from an activity in one place to compensate for emissions elsewhere—are a way to address climate change by paying someone else to reduce emissions. To be credible, an offset must be additional—it must reduce emissions below the quantity emitted in a business-as-usual scenario—among other criteria. Assessing credibility is inherently challenging because it is difficult to make business-as-usual projections. Outside the U.S., offsets may be purchased on compliance markets to meet requirements to reduce emissions. In the U.S., there are no federal requirements and offsets may be purchased in the voluntary market.

GAO was asked to examine (1) the scope of the U.S. voluntary carbon offset market, including the role of the federal government; (2) the extent to which mechanisms for ensuring the credibility of offsets are available and used and what, if any, related information is shared with consumers; and (3) trade-offs associated with increased oversight of the U.S. market and including offsets in climate change mitigation policies. This report is based on analysis of literature and data, interviews with stakeholders, and GAO's purchase of offsets.

What GAO Recommends

GAO is not recommending executive action. However, as it considers legislation that allows the use of offsets for compliance, Congress might consider, among other things, directing the establishment of standardized quality assurance mechanisms.

To view the full product, including the scope and methodology, click on [GAO-08-1048](#). For more information, contact John B. Stephenson at (202) 512-3841 or stephensonj@gao.gov.

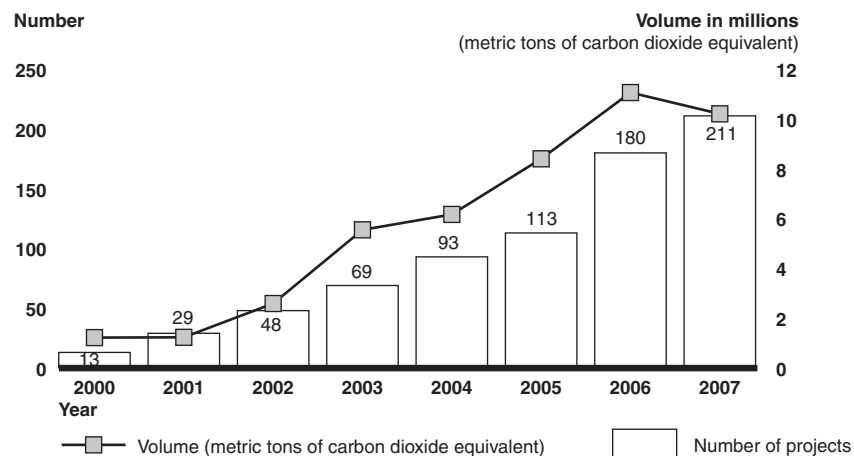
CARBON OFFSETS

The U.S. Voluntary Market Is Growing, but Quality Assurance Poses Challenges for Market Participants

What GAO Found

The scope of the U.S. voluntary carbon offset market is uncertain because of limited data, but available information indicates that the supply of offsets generated from projects based in the United States is growing rapidly. Data obtained from a firm that analyzes the carbon market show that the supply of offsets increased from about 6.2 million tons in 2004 to about 10.2 million tons in 2007. Over 600 organizations develop, market, or sell offsets in the United States, and the market involves a wide range of participants, prices, transaction types, and projects. The federal government plays a small role in the voluntary market by providing limited consumer protection and technical assistance, and no single regulatory body has oversight responsibilities.

U.S. Supply of Voluntary Offsets by Volume and Number of Projects from 2000 through 2007



Source: GAO analysis of Point Carbon data.

A variety of quality assurance mechanisms, including standards for verification and monitoring, are available and used to evaluate offsets, but data are not sufficient to determine the extent of their use. Information shared with consumers on credibility is also limited. Participants in the offset market face challenges ensuring the credibility of offsets, including problems determining additionality, and the existence of many quality assurance mechanisms. GAO, through its purchase of offsets, found that the information provided to consumers by retailers offered limited assurance of credibility.

Increased federal oversight of the U.S. voluntary market could enhance the market's transparency and improve consumer protection, but may also reduce flexibility, increase administrative costs, and stifle innovation, according to certain stakeholders. Including offsets in regulatory programs to limit greenhouse gas emissions could also lower the cost of compliance, according to recent EPA analyses and economic literature. However, some stakeholders said that concerns about the credibility of offsets could compromise the environmental integrity of a compliance system.

Contents

Letter		1
	Results in Brief	7
	The U.S. Voluntary Market Is Growing Rapidly with Limited Federal Oversight	9
	A Variety of Quality Assurance Mechanisms Are Available and Used, but Information on the Credibility of Offsets Is Limited	23
	Both Increased Federal Oversight and the Use of Offsets in Climate Change Policies Involve Trade-offs between Cost and Credibility	31
	Concluding Observations	37
	Matter for Congressional Consideration	38
Appendix I	Objectives, Scope, and Methodology	40
Appendix II	Description of Offset Project Types	43
Appendix III	Volume and Number of Offset Projects by State in 2007	44
Appendix IV	Description of the Purchase of Carbon Offsets by the Chief Administrative Officer of the House of Representatives	46
Appendix V	Summary of Stakeholder Responses to Interview Questions	51
Appendix VI	Summaries of Selected International, Regional, and State Programs	54
Appendix VII	Selected Carbon Offset Standards	56

Appendix VIII	GAO Contact and Staff Acknowledgments	59
----------------------	--	-----------

Tables

Table 1: U.S. Project Types by Number, Volume, and Percentage of Total Supply in 2007	17
Table 2: Descriptions of Selected Additionality Tests	26
Table 3: Stakeholders' Rating of Carbon Offset Market Challenges	51
Table 4: Stakeholders' Rating of Characteristics of Offset Credibility	52
Table 5: Stakeholders' Rating of the Credibility of Different Types of Carbon Offset Projects	53

Figures

Figure 1: Hypothetical Depiction of Offset Project Measured against Business-as-Usual Scenario	2
Figure 2: Generalized Carbon Offsets Supply Chain	4
Figure 3: Common Offset Project Types	12
Figure 4: U.S. Supply of Offsets by Volume and Number of Projects from 2000 through 2007	14
Figure 5: U.S. Offset Supply by Type of Project in 2007	15
Figure 6: Volume and Number of Offset Projects by State in 2007	18
Figure 7: Quality Assurance Mechanisms in a Simplified Carbon Offset Supply Chain	24

Abbreviations

CAO	U.S. House of Representatives Office of the Chief Administrative Officer
CCBS	Carbon Capture and Biological Storage
CCGS	Carbon Capture and Geological Storage
CCX	Chicago Climate Exchange
CFTC	Commodity Futures Trading Commission
DEFRA	United Kingdom Department for Environment, Food, and Rural Affairs
ECM	Exempt Commercial Market
EIA	Energy Information Administration
EPA	Environmental Protection Agency
EU	European Union
FTC	Federal Trade Commission
FWS	U.S. Fish and Wildlife Service
NFF	National Forest Foundation
REC	Renewable Energy Certificate
UK	United Kingdom
USDA	United States Department of Agriculture

This is a work of the U.S. government and is not subject to copyright protection in the United States. The published product may be reproduced and distributed in its entirety without further permission from GAO. However, because this work may contain copyrighted images or other material, permission from the copyright holder may be necessary if you wish to reproduce this material separately.



United States Government Accountability Office
Washington, DC 20548

August 29, 2008

Congressional Requesters

Carbon offsets provide a way for individuals, businesses, and governments to address concerns about the impact of their greenhouse gas emissions on the earth's climate by paying others to undertake activities that reduce, avoid, or sequester greenhouse gases.¹ A carbon offset can be defined as a measurable reduction of greenhouse gas emissions from an activity or project in one location that is used to compensate for emissions occurring elsewhere. For example, a U.S. manufacturer might offset its emissions by funding an external project that captures methane, a greenhouse gas emitted from agricultural sources and landfills. The emissions reduced, avoided, or sequestered by such projects are collectively termed carbon offsets, though they may involve different greenhouse gases.²

Carbon offsets are a potentially attractive option for those interested in addressing concerns about climate change because they can offer a potentially low-cost and convenient means of reducing, avoiding, or sequestering greenhouse gas emissions relative to other options, such as altering manufacturing processes or using less fossil fuel.³ At the same time, consumers of offsets need assurance that buying an offset has the same effect on emissions as if they had decided to reduce emissions on

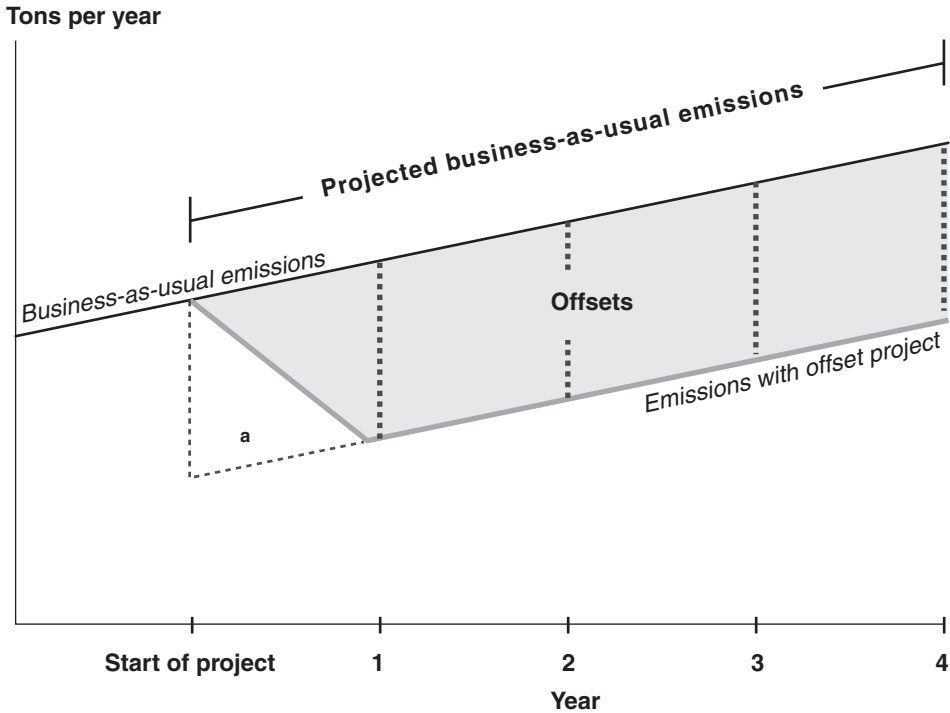
¹Major greenhouse gases include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and synthetic gases: hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆).

²Carbon offsets are typically quantified and described in terms of metric tons of carbon dioxide equivalent. A metric ton equals 2,205 pounds, while a short ton, a measurement used in the United States, equals 2,000 pounds. Unless otherwise specified, this report uses metric tons. Carbon dioxide equivalents provide a common standard for measuring the warming potential of different greenhouse gases and are calculated by multiplying the emissions of the non-carbon dioxide gas by its global warming potential, a factor that measures its heat-trapping ability relative to that of carbon dioxide.

³In 2006, carbon dioxide released from the burning of fossil fuels accounted for approximately 78 percent of human-caused greenhouse gas emissions in the United States. The remaining 22 percent of emissions included carbon dioxide from nonenergy use of fossil fuels and iron and steel production; methane from landfills, coal mines, oil and gas operations, and agriculture; nitrous oxide from fossil fuels, fertilizers, and industrial processes; and other synthetic gases emitted from industrial sources, such as sulfur hexafluoride and perfluorocarbons, from the production of magnesium and aluminum.

their own. Providing this assurance 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 1 for a hypothetical depiction of an offset project measured against a projected business-as-usual scenario.

Figure 1: Hypothetical Depiction of Offset Project Measured against Business-as-Usual Scenario



Source: GAO.

Notes: Business-as-usual emissions could be stable, increase, or decrease over time depending upon the source.

The shaded area in the diagram represents carbon offsets generated from the project.

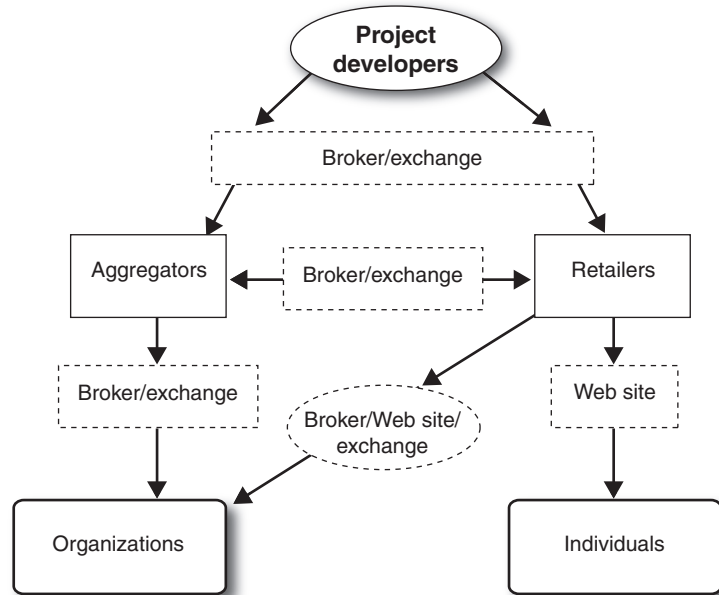
^aEmissions reductions from an offset project could occur immediately or gradually over time, depending upon the project type.

Although definitions differ, our review of literature and discussions with stakeholders identified four general criteria for credible 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. In addition, it is important to ensure that double-counting of a particular offset does not occur, where multiple purchasers use the same offset. Participants in the offset market may use a variety of quality assurance mechanisms to substantiate the credibility of offsets. Market participants may also track the sale and ownership of offsets by using one of several registries. The use of a registry may help participants share details about offsets available for purchase on the market.

Participants in the offset market include project developers, who identify and perform actions that reduce, avoid, or sequester emissions; third party verifiers, who ensure that projects adhere to relevant quality assurance mechanisms; intermediaries, including aggregators, who buy offsets and bundle them into larger quantities for resale; and retailers, who market and sell offsets to consumers, including organizations and individuals. Other participants include brokers and exchanges, which facilitate transactions between buyers and sellers. Participants may play multiple roles. For example, a single company may develop projects, purchase offsets from other developers, and market offsets to consumers. Project developers may also skip steps in the supply chain and sell directly to consumers. Figure 2 illustrates a generalized carbon offsets supply chain.

Figure 2: Generalized Carbon Offsets Supply Chain



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

Note: Dashed boxes illustrate optional steps. Quality assurance mechanisms may be employed at multiple stages of the supply chain.

Some carbon offsets are purchased by entities that are subject to legal requirements to decrease their greenhouse gas emissions, such as the European Union's (EU) Emissions Trading Scheme.⁴ In such cases, the market for offsets is referred to as a "compliance market." In contrast, the U.S. market is a "voluntary market," and purchasers are not required to limit their emissions or purchase offsets. However, the Congress is considering several proposals for limiting greenhouse gas emissions that would enable regulated entities to rely, in part, on offsets for compliance in a fashion similar to the European Union's program. Offsets also may play a role in U.S. state and regional programs that are under development.

⁴The EU's program to limit greenhouse gas emissions enables regulated entities to use certain types of offsets, including Clean Development Mechanism (CDM) credits, for compliance. The CDM, administered by the United Nations, is part of the Kyoto Protocol. CDM enables industrialized countries to achieve emissions reductions by paying for certified emission reduction credits, each equivalent to one metric ton of carbon dioxide, from projects in developing countries. GAO is reviewing the European Union's program and the CDM in a report that we will issue later in 2008.

A brief description of certain international and domestic programs is provided in appendix VI.

In the United States, market participants may purchase offsets through the Chicago Climate Exchange (CCX) and on the retail market, which includes transactions that occur outside of a formal exchange. CCX is a voluntary greenhouse gas reduction and trading system through which members make legally binding commitments to reduce their emissions.⁵ In addition to these members, the CCX platform is also available to offset providers, who may register tons on CCX that represent various greenhouse gas reduction projects. CCX participants may trade offsets generated from qualifying emissions reduction projects. According to CCX, to verify the validity of offsets offered for sale on the exchange, and ensure that the underlying offset projects conform to CCX rules, all tons registered for sale have been verified by approved third party verification firms that are specialized in particular fields. Further, in addition to other quality assurance procedures, CCX market participants use a registry to help track purchases and sales of offsets acquired or sold on the exchange. In contrast to exchange trading, which occurs through platforms designed to facilitate trades on a larger scale, retail sales typically involve transactions directly between two parties. However, certain retailers buy offsets through CCX and retire them on behalf of consumers.⁶ In addition, offsets may be bought and sold across international borders and through Web sites.

In this context, you asked us to (1) describe the scope of the U.S. voluntary carbon offset market, including the role of the federal government; (2) analyze the extent to which mechanisms for ensuring the credibility of voluntary carbon offsets are available and used, and what, if any, related information is shared with consumers; and (3) assess the trade-offs associated with increasing the federal oversight of the U.S.

⁵CCX defines “legally binding” to mean that members who undertake the reduction commitment sign a contract with CCX that requires them to abide by the CCX rulebook, submit their emissions data to a standardized data review by Financial Industry Regulatory Authority (FINRA), and be subject to the various governance committees of CCX for a stipulated and fixed period of membership. CCX Phase I required compliance from 2003 to 2006 and Phase II from 2007 to 2010.

⁶The term “retirement” refers to the permanent recorded disposition of an offset after which it cannot be resold or otherwise used by any entity to facilitate, enable, or offset any past, present, or future greenhouse gas emission.

voluntary carbon offset market and incorporating offsets into broader climate change mitigation policies.

In conducting our work, we reviewed available government and trade literature related to carbon offset markets and conducted semistructured interviews with nonprobability samples of stakeholders, including providers, third party verifiers, and other knowledgeable stakeholders.⁷ To respond to the first objective, we interviewed officials responsible for offset-related programs at the departments of Agriculture (Forest Service), Energy (Energy Information Administration), and Interior (U.S. Fish and Wildlife Service), as well as the Commodity Futures Trading Commission (CFTC), the Environmental Protection Agency (EPA), the Federal Trade Commission (FTC), and the U.S. House of Representatives Office of the Chief Administrative Officer (CAO). We also met with, among others, representatives of the Council on Environmental Quality and officials responsible for managing state and regional greenhouse gas mitigation programs. To obtain detailed information about carbon offset projects in the United States, we purchased and analyzed data from Point Carbon, a provider of independent carbon market news, analysis, and consulting services.⁸ We assessed the reliability of these data and determined that they were sufficiently reliable for the purposes of this report. In addition, to respond to the second objective, we purchased offsets from a nonprobability sample of retail providers and analyzed the materials we received in return as well as information provided on Web sites. To respond to the third objective, we reviewed available economic literature and information collected through stakeholder responses to semistructured interview questions. A more detailed description of our scope and methodology is presented in appendix I. We conducted our work from July 2007 to August 2008.

⁷Nonprobability samples cannot be used to generalize or make inferences about a population. In this instance, we cannot generalize the results of our interviews to all carbon offset market participants.

⁸These data represent a conservative estimate of supply because Point Carbon estimates that its database accounts for approximately 80 percent of the offsets generated from projects located in the United States based on its analysis of domestic and global carbon markets.

Results in Brief

The scope of the U.S. voluntary carbon offset market is uncertain because complete data on the volume of transactions do not exist, but available information shows that the supply of offsets generated from projects based in the United States is growing rapidly. In addition, the role of the federal government in the market is generally limited to certain consumer protection and technical assistance efforts, although several agencies facilitate offset projects or purchase offsets as part of efforts to address the environmental impacts of their operations. Over 600 entities develop, market, or sell offsets in the United States, and the exchange of offsets may involve a wide range of participants, prices, transaction types, and projects. Data on the total volume of offsets traded in the United States are not available and the market's transparency is limited. Despite the lack of complete data on the overall volume of transactions, available data show a significant increase in the supply of offsets generated in the United States. Specifically, the supply has increased approximately 66 percent, from about 6.2 million tons in 2004 to about 10.2 million tons in 2007.

Furthermore, the supply is concentrated in a handful of states—projects in Texas and Virginia accounted for 34 percent of the total volume in 2007—and about 49 percent of the offsets were generated from projects that involved methane, a potent greenhouse gas. While data on the average price of offsets paid by U.S. consumers were not available, prices paid on the global market ranged from \$1.83 per ton to \$306 per ton in 2007, with a volume-weighted average of \$6 per ton, according to a 2007 report by two market research organizations. The federal government plays a small role in the voluntary market, and no single regulatory body has oversight responsibility. The CFTC, EPA, and FTC, among others, have undertaken some consumer protection and technical assistance efforts. In addition, the Forest Service and the Fish and Wildlife Service are involved in partnerships that may result in the generation of offsets on public lands, and the Chief Administrative Officer of the House of Representatives has purchased offsets as part of the House's efforts to address its environmental impacts. While federal oversight is limited, offset transactions are subject to applicable state fraud and consumer protection laws, which are generally enforced by each state's attorney general.

A variety of quality assurance mechanisms are available and used in the U.S. voluntary offset market, but the extent of their use is uncertain. In addition, our purchase of offsets from a nonprobability sample of retailers found that the information given to consumers provided limited assurance of credibility. Available data show that many carbon offsets in the voluntary market were subject to some quality assurance mechanisms, but the data are not sufficient to determine the extent of their use. The available information suggests that fewer providers use registries to track

the ownership and disposition of offsets than use third party verification or other quality assurance mechanisms. Participants in the offset market face several challenges to ensuring the credibility of offsets, including problems determining additionality, and the existence of many quality assurance mechanisms for verification and monitoring. The lack of comprehensive data on the use of quality assurance mechanisms and differences in the substance and application of these mechanisms limit the market's transparency and raise questions about whether offsets are interchangeable commodities. To understand the perspective of consumers, we purchased offsets from 33 retail providers and found that the information they provided about the offsets varied considerably and offered limited assurance of credibility. Specifically, 3 of 33 retailers provided information related to the additionality of the underlying projects along with our purchase, and only 9 provided information related to the use of quality assurance mechanisms, including verification and monitoring. A majority of the providers, however, did provide further information on their Web sites that was not directly related to our transactions. Overall, we did not always obtain sufficient information to understand exactly what we received as a result of the transaction, and other consumers may face similar challenges with their transactions.

Increased federal oversight of the U.S. voluntary market could address some concerns about the credibility of offsets, but would likely increase costs for providers and consumers. Similarly, including offsets in regulatory programs intended to limit greenhouse gas emissions could lower the cost of compliance, but may make it more difficult to ensure that the programs achieve their goals. Greater oversight of the U.S. voluntary market could increase the credibility of offsets and enhance consumer protection, according to certain stakeholders and the available literature. However, more oversight could reduce flexibility and increase the administrative burden on providers, which could raise costs and stifle innovation. Using offsets in a mandatory emissions reduction program would involve similar trade-offs. Specifically, offsets could lower the cost of compliance, encourage investment and innovation in sectors not required to reduce emissions, and provide time for regulated entities to change existing technologies. Recent EPA analyses state that the cost of compliance with proposed greenhouse gas legislation decreases considerably as the allowable use of offsets increases. This is because it is often cheaper for regulated entities to pay for offsets than to make reductions themselves. Several stakeholders said that using offsets for compliance could also give regulated entities increased flexibility to meet emissions reduction requirements and could give them time to implement long-term plans and develop new technologies. However, any use of

offsets for compliance that lack credibility would undermine the achievement of the program's goals. In addition, some stakeholders said that the availability of low-cost offsets could discourage regulated entities from investing in technology to reduce their own emissions. Finally, the stakeholders varied in their views on the extent to which regulated entities should be allowed to rely on offsets in a compliance scheme.

We are not recommending executive actions. However, as the Congress considers legislation intended to limit greenhouse gas emissions that allows the use of carbon offsets for compliance, it may wish to incorporate provisions that would direct the relevant federal agency (or agencies) to establish (1) clear rules about the types of offset projects that regulated entities can use, 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.

The U.S. Voluntary Market Is Growing Rapidly with Limited Federal Oversight

Over 600 organizations develop, market, or sell offsets in the United States, and the market involves a wide range of participants, prices, transaction types, and projects. While the exact scope of the U.S. voluntary market is uncertain because of a lack of complete data, available information shows that the supply of offsets generated in the United States has increased by about 66 percent over the last 3 years, from about 6.2 million tons in 2004 to about 10.2 million tons in 2007. The federal government plays a small role in the U.S. market. While no single regulatory body oversees the market, FTC and EPA, among others, have undertaken some consumer protection and technical assistance efforts. In addition, certain federal entities participate in the market as providers and consumers. For example, the Forest Service works with a nonprofit partner that solicits donations to support forestry projects.

The Market Includes a Range of Participants, Prices, and Transaction Types

A wide range of participants are involved in the U.S. voluntary market, including providers of different types of offsets, developers of quality assurance mechanisms, third party verifiers, and consumers who purchase offsets from domestic or international providers. According to available data, more than 600 entities are involved in the supply of offsets in the United States, including companies, governments, colleges and universities, and other organizations.

- Offset providers include project developers and intermediaries. We identified 210 offset providers of various types, including 87 U.S.-based providers. Project developers implement individual projects and may sell offsets directly to consumers or to intermediaries. Intermediaries are further subdivided into retailers, aggregators, and brokers, among other categories. Retailers generally sell smaller quantities of offsets to individuals or organizations. Aggregators, also known as wholesalers, sell in bulk and often own a portfolio of offsets. Brokers facilitate transactions between sellers and buyers. Providers obtain the rights to the offsets they sell in a number of ways, including developing their own projects or purchasing directly from project developers, sometimes through brokers. Other providers purchase and retire offsets through CCX on behalf of customers. Providers may also play multiple roles in the offset market. For example, a single company may develop projects, aggregate offsets from other projects or providers for resale, and sell offsets directly to consumers. In addition, other entities, including investment banks and other financial institutions, support the development of projects through financing.
- Quality assurance providers include those involved in activities such as verification and monitoring of offset projects, and the development of quality assurance mechanisms such as accounting standards for calculating offsets. Project developers may use a third party verifier to confirm that offsets generated by a project were accurately calculated. Once verified, the offset might then be recorded by another independent party in a registry to track its sale and ownership. Multiple registries operate in the United States to help market participants track the ownership and retirement of offsets, although not all offsets are listed on registries.
- A wide variety of consumers buy offsets, including individuals, businesses, nonprofits, governments, research institutions, universities, religious congregations, utilities, and other organizations. Consumers' motivations for purchasing offsets may include corporate responsibility and public relations, among others. Consumers may purchase offsets to compensate for emissions that result from a variety of activities including flying, driving, and purchasing consumer products.

Offsets sell on the market at a wide range of prices. In 2007, prices on the global voluntary market ranged from \$1.83 per ton to about \$306 per ton, with an average of about \$6 per ton, according to one recent market study.⁹ We purchased offsets from 33 retail providers, both domestic and international, and prices ranged from about \$5 per ton to about \$31 per ton. CCX prices were at their lowest in 2004, at \$0.79 per ton, but recently peaked at \$7.40 per ton in June 2008.¹⁰

There are also different types of carbon offset transactions, including direct purchase and payment or donation in support of a service. The difference between these transactions is whether the offsets are sold as a commodity. In a direct purchase, consumers pay for the delivery of offsets as a commoditized economic good. Direct purchases may allow the consumer to evaluate the parameters of the offset project, including how verification and monitoring methodologies were employed to create the offset. When the transaction does not involve the exchange of a commodity, consumers pay or donate money to a provider to support the retirement of offsets or the development of new offset projects, but the consumer does not own an asset after the transaction has been completed. In this case, the payment or donation amounts to a promise by the provider to supply the service of purchasing offsets or supporting offset projects. Donations may be tax deductible, effectively reducing the cost of the carbon offset.

Another key distinction involves the timing of an offset's creation. 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.

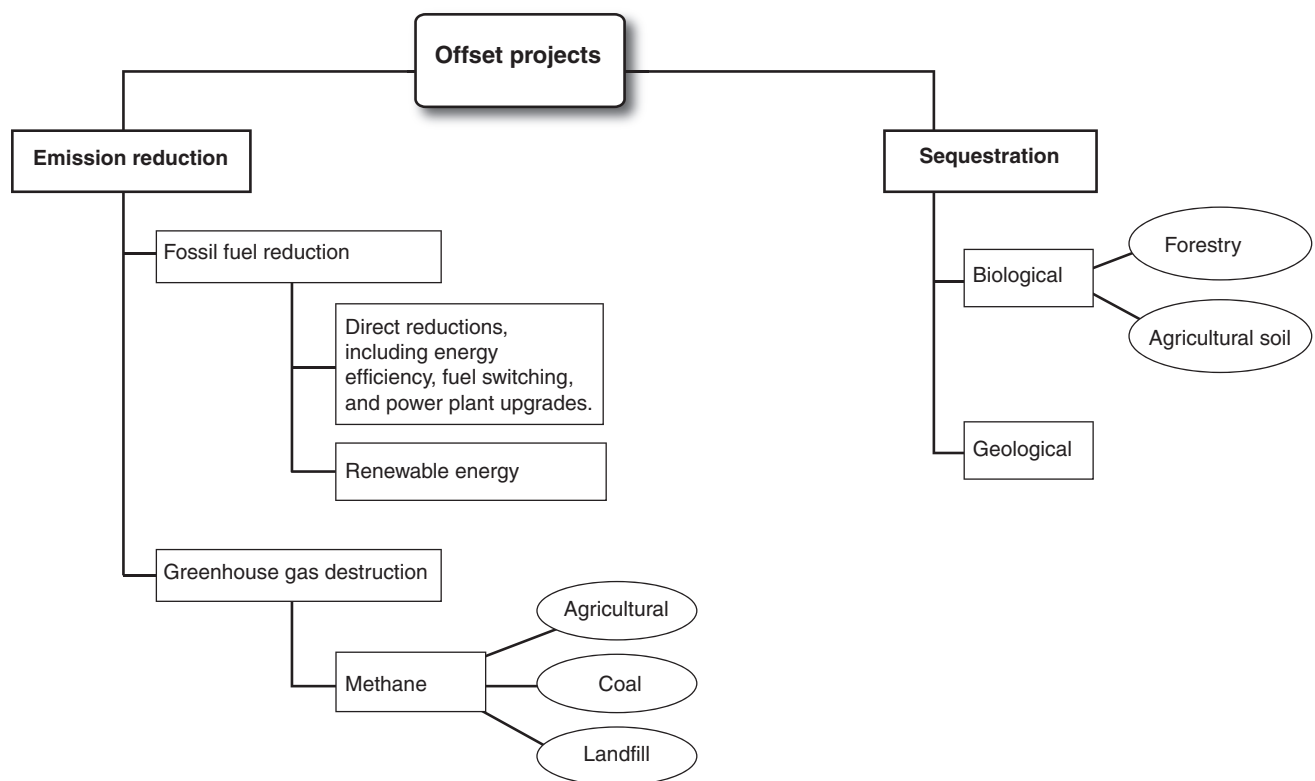
⁹Katherine Hamilton, Milo Sjardin, Thomas Marcello, and Gordon Xu, *Forging a Frontier: State of the Voluntary Carbon Markets 2008* (Ecosystem Marketplace and New Carbon Finance: May 2008). This report said that the \$306 per ton price resulted from one particularly high transaction. The sponsors of Ecosystem Marketplace include, among others, organizations that facilitate projects to reduce, avoid, or sequester greenhouse gas emissions. Prices are reported in 2008 U.S. dollars.

¹⁰See <http://www.chicagoclimatex.com/market/data/summary.jsf> for CCX market information. Prices are reported in 2008 U.S. dollars.

Project Developers Generate Offsets from a Wide Range of Activities

In addition to a range of participants, project developers generate offsets from different types of projects by either reducing emissions at the source or through sequestration. Emission reduction projects involve either fossil fuel projects based on changes in energy production and use practices—such as energy efficiency, fuel switching, power plant upgrades, and certain renewable energy projects—or greenhouse gas destruction projects, including projects that capture and destroy methane from coal mines, landfills, and agricultural operations. Sequestration projects include biological sequestration projects that pull carbon dioxide out of the air by, for example, planting trees or enhancing the management of agricultural soils, and geological sequestration projects that capture and store carbon dioxide in underground formations. See figure 3 for a diagram of common types of carbon offset projects, and see appendix II for descriptions of offset project types.

Figure 3: Common Offset Project Types



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

The Scope of the Market Is Uncertain, but Supply Is Growing Rapidly

The U.S. voluntary market is part of an expanding global market, with an estimated 65 million tons sold in 2007, valued at approximately \$337.3 million.¹¹ Complete data on the volume of offsets traded in the United States are not available, and the market's transparency is limited. Efforts to quantify and report on the voluntary carbon market have focused on the global market and include limited information focused solely on the United States. It is also difficult to separate out the U.S. portion of the global market because U.S. market participants buy and sell across domestic and international boundaries and transactions are private. However, according to one study, an estimated 23 percent of the volume sold in 2007 on the global market came from U.S. providers.¹²

While the exact scope of the U.S. voluntary carbon offset market is uncertain because of a lack of complete data, available information shows that the supply of offsets based in the United States is growing rapidly. In the last 3 years, the supply of offsets from projects based in the United States increased approximately 66 percent, from about 6.2 million tons in 2004 to about 10.2 million tons in 2007.¹³ By comparison, EPA data show that U.S. greenhouse gas emissions have averaged about 7 billion tons annually since 2000. In addition, in 2007, at least 211 projects produced offsets in the United States, as compared to 93 projects in 2004, an increase of about 125 percent.¹⁴ See figure 4 for data on the U.S. supply of offsets.

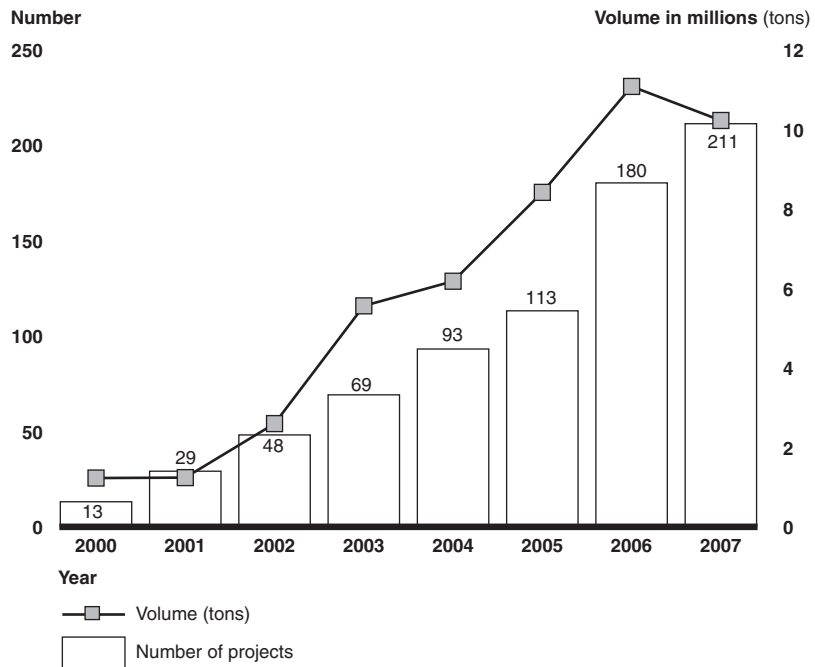
¹¹Hamilton, Sjardin, Marcello, and Xu, *Forging a Frontier*. Prices are reported in 2008 U.S. dollars.

¹²Hamilton, Sjardin, Marcello, and Xu, *Forging a Frontier*.

¹³GAO analysis of Point Carbon data.

¹⁴GAO analysis of Point Carbon data.

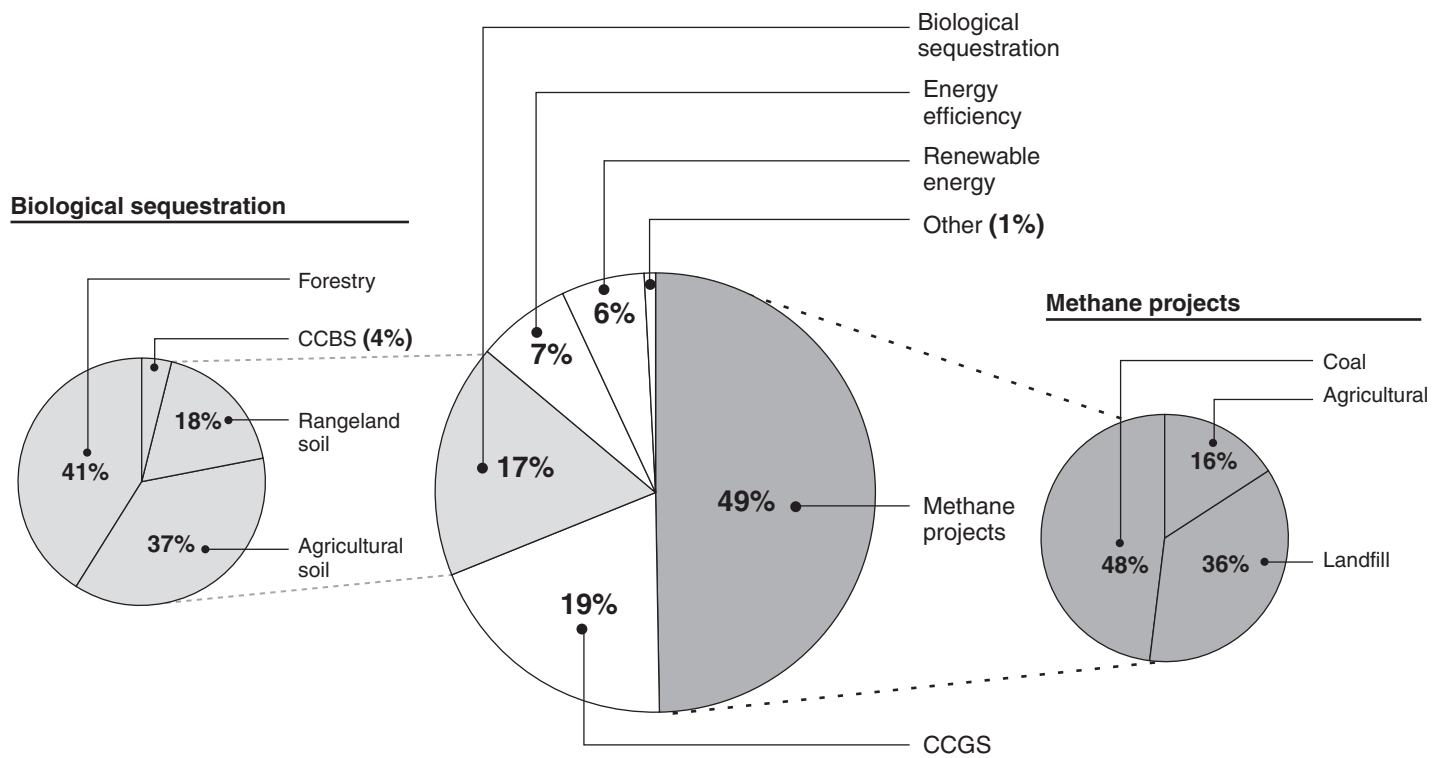
Figure 4: U.S. Supply of Offsets by Volume and Number of Projects from 2000 through 2007



Source: GAO analysis of Point Carbon data.

Of the total U.S. offset supply in 2007, about 85 percent was generated from three categories of projects: methane, carbon capture and geological storage (CCGS), and biological sequestration. About 49 percent of U.S. supply was produced from projects that capture and destroy methane from coal mines, agricultural operations, or landfills. An additional 19 percent was produced from CCGS projects that capture emissions from industrial and energy-related emissions sources and then store these emissions in geologic formations. Also, 17 percent was produced from biological sequestration projects, including agricultural soil projects such as no-till farming and forestry projects. Figure 5 illustrates U.S. offset supply by project type in 2007.

Figure 5: U.S. Offset Supply by Type of Project in 2007



Source: GAO analysis of Point Carbon data.

Notes: CCBS refers to carbon capture and biological storage. Totals may not equal 100 because of rounding.

Coal Mine Methane

Coal mines account for about 10 percent of all man-made methane emissions in the United States. Methane, a potent greenhouse gas, is contained in coal seams and presents a safety hazard for mine operators because it is explosive at certain concentrations in the air. Underground coal mines are designed and operated so that methane released during the extraction of coal is removed from the mine through powerful ventilation fans and is typically vented to the atmosphere. Utilization of recovered methane is not currently a typical operational practice at underground coal mines. However, through an offset project, such methane could be recovered and burned for its energy content or flared to reduce its heat-trapping ability when released to the atmosphere.

One factor influencing the quantity of offsets generated from a particular project is the type of greenhouse gas involved. This is because most greenhouse gases, including methane, have greater heat-trapping ability relative to carbon dioxide. Thus, the global warming potential of these greenhouse gases influences the volume of offsets generated. For example, reducing one ton of methane emissions has the same effect as decreasing 25 tons of carbon dioxide.¹⁵ Accordingly, projects that decrease gases with high global warming potential may be attractive from a developer's perspective.

Available data show that in 2007, 93 of the 211 projects that produced offsets in the United States were methane projects.¹⁶ Of these, 5 coal mine projects—2 percent of the total—accounted for 24 percent of the total volume generated in 2007. On the other hand, 62 biological sequestration projects (about 29 percent of the total) produced 17 percent of the supply. This includes 52 forestry projects that produced about 7 percent of total supply from U.S.-based projects. Table 1 presents U.S. project types by number, volume, and percentage of total supply in 2007.

¹⁵See the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.

¹⁶GAO analysis of Point Carbon data.

Table 1: U.S. Project Types by Number, Volume, and Percentage of Total Supply in 2007

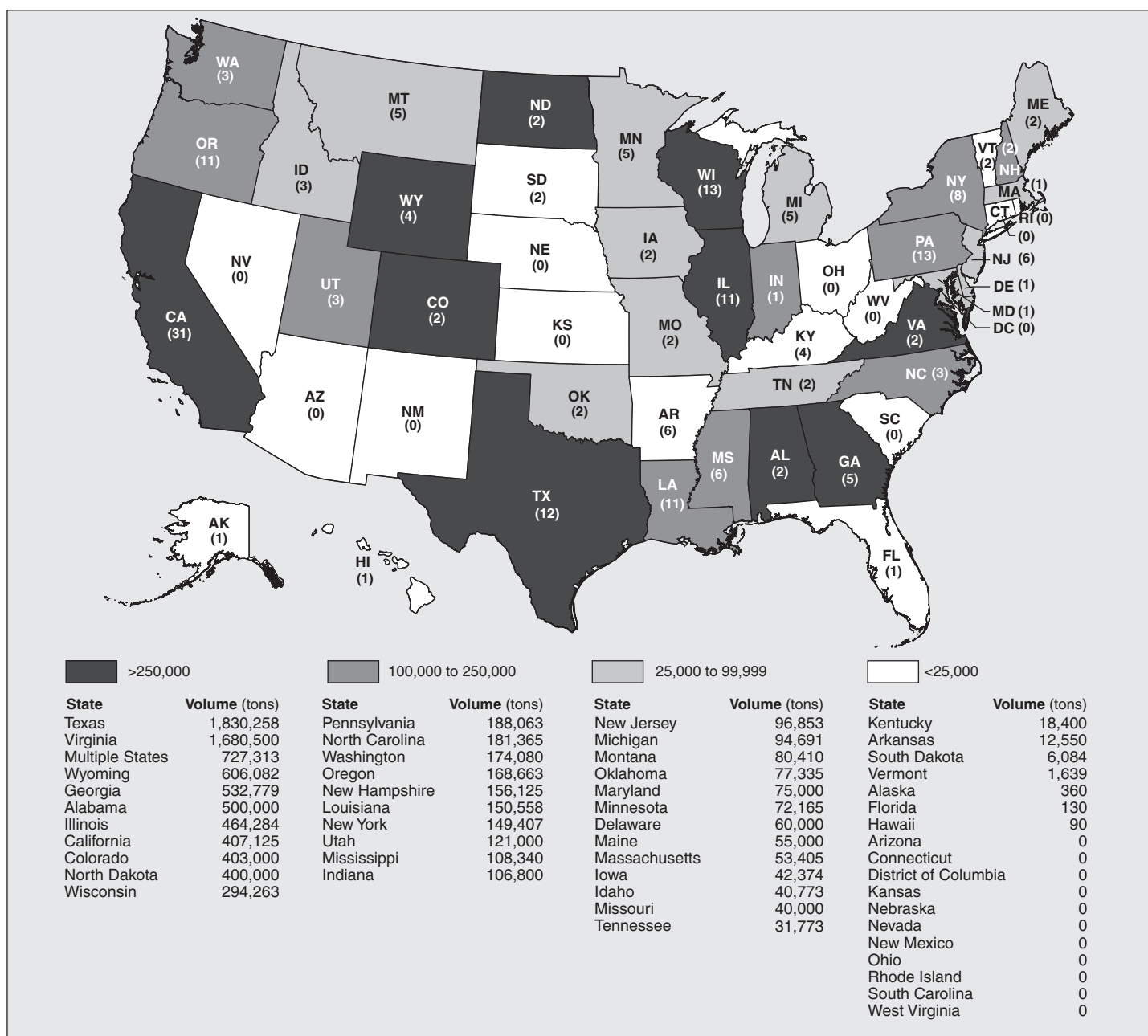
Project type	Number of projects	Percentage of total projects	Total volume	Percentage of total volume
Methane projects	93	44%	5,044,583	49%
Agricultural	51	24%	798,222	8%
Landfill	37	18%	1,803,111	18%
Coal	5	2%	2,443,250	24%
Biological sequestration	62	29%	1,706,982	17%
Forestry	52	25%	693,282	7%
Agricultural soil	7	3%	628,700	6%
Rangeland soil	2	1%	310,000	3%
Carbon capture and biological storage (CCBS)	1	<1%	75,000	1%
Renewable energy	33	16%	631,073	6%
Energy efficiency	10	5%	701,262	7%
Carbon capture and geological storage	7	3%	1,977,366	19%
Other	6	3%	147,770	1%
Total	211		10,209,036	

Source: GAO analysis of Point Carbon data.

Note: Totals may not equal 100 because of rounding.

In the United States, projects are located in 40 states, but 34 percent of the supply in 2007 was produced by 14 projects in Texas and Virginia. Projects in these states include high-yielding projects such as coal mine methane projects. While California had the greatest number of projects in 2007, these 31 projects accounted for about 4 percent of the total supply. Figure 6 presents the volume and number of offset projects by state, and detailed data are provided in appendix III.

Figure 6: Volume and Number of Offset Projects by State in 2007



Sources: GAO analysis of Point Carbon data; Map Resources (map).

Note: Twelve projects occur across multiple states. The data for these projects are included under the category of multiple states and not included in the volume or number of projects for the individual states involved in these projects.

The Federal Government Plays a Small Role in the Market

While no single regulatory body has oversight of the U.S. voluntary carbon offset market as a whole, offset transactions are subject to applicable state fraud and consumer protection laws, which are generally enforced by each state's attorney general. Certain federal entities provide some consumer protection and technical assistance efforts and also participate in the market as providers and consumers.

- Commodity Futures Trading Commission

The mission of the Commodity Futures Trading Commission is to protect market users and the public from fraud, manipulation, and abusive practices related to the sale of commodity and financial futures and options, and to foster open, competitive, and financially sound futures and option markets. The CFTC exercises limited oversight over the Chicago Climate Exchange due to its status as an Exempt Commercial Market (ECM), a category established under the Commodity Futures Modernization Act of 2000. Participants in such markets, in general terms, must be large, sophisticated traders. Moreover, ECMs are allowed to trade only exempt commodities.¹⁷ ECMs must abide by certain notification requirements and affirm annually that they continue to operate under the same parameters.

The 2008 Farm Bill increases the CFTC's oversight of ECM contracts that serve a significant price discovery function.¹⁸ The CFTC confirmed that CCX is eligible to operate as an ECM, but at this time, CCX's contracts have not been determined by the CFTC to serve a significant price discovery function. In cases where contracts serve a significant price discovery function, ECMs must adhere to a number of core principles, including monitoring of trading and the submission of certain data to the CFTC. Generally, CCX operates with less oversight because participants in the market are experienced. However, if the CFTC receives complaints, it can take appropriate action.

- Department of Agriculture, Forest Service

The mission of the Forest Service, an agency within the Department of Agriculture (USDA), is to sustain the health, diversity, and productivity of

¹⁷ According to CFTC officials, exempt commodities include emissions allowances.

¹⁸ Price discovery refers to the process by which market prices incorporate new information.

the nation's forests and grasslands to meet the needs of present and future generations. The Forest Service works with a congressionally chartered nonprofit partner, the National Forest Foundation (NFF), to solicit donations to the Carbon Capital Fund, which provides financial support for carbon sequestration projects on lands managed by the Forest Service. The Carbon Capital Fund donations are invested in Forest Service reforestation projects to sequester carbon. According to the Forest Service, donations to the Carbon Capital Fund will be used to replant areas on national forests that have been damaged by wildfire and other natural disturbances and to demonstrate the role of forest carbon sequestration in addressing climate change. The Forest Service manages the reforestation projects and also selects the project sites by using a forest vegetation simulation model to estimate the amount of carbon that will be sequestered by prospective projects. NFF operates the fund and uses a private contractor to measure and verify offsets. The first demonstration project was planned for the summer of 2008 on the Custer National Forest in Montana and South Dakota, and projects tentatively scheduled for the summer of 2009 will take place on the Plumas and San Bernardino National Forests in California.

According to Forest Service and NFF officials, they offer no guarantees about the performance of Carbon Capital Fund projects. Donations to the fund do not transfer rights or ownership of offsets. USDA officials said that contributions to the fund are donations and do not create tradable offsets. These officials also said that donations to the Carbon Capital Fund would enable the Forest Service to plant trees, which would, in the long term, lead to carbon reductions. NFF said that it would notify donors if the forestry projects fail and that it plans to send documentation to donors, including pictures, when projects are complete. As of January 2008, a total of about \$55,000 had been donated to the fund. Ten percent of the donations was set aside for third party verification and monitoring, according to NFF.

USDA also encourages the use of consistent forestry and agriculture offset methodologies by working with market participants such as the Chicago Climate Exchange and state and regional programs. For example, USDA's Natural Resources Conservation Service provided a \$750,000 grant to the Chicago Climate Exchange to promote the inclusion of agriculture projects in the offset market by lowering costs and developing methodologies for calculating reductions from no-till farming and establishing a pool of project verifiers.

- Department of Energy, Energy Information Administration

The mission of the Energy Information Administration (EIA) is to provide policy-neutral data, forecasts, and analyses to promote sound policy making, efficient markets, and public understanding regarding energy and its interaction with the economy and the environment. EIA's Voluntary Reporting of Greenhouse Gases Program, established under section 1605(b) of the Energy Policy Act of 1992, provides a means for organizations and individuals who have reduced their emissions to record their accomplishments in a registry. In 2006 and 2007, EIA revised the program to allow participants to report on offsets in certain circumstances. The revised guidelines have not yet been implemented.

- Department of the Interior, U.S. Fish and Wildlife Service

The mission of the U.S. Fish and Wildlife Service (FWS), a bureau within the Department of the Interior, is to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. FWS partners with companies and nonprofits to develop carbon sequestration projects on national wildlife refuges in the southeastern United States. FWS enters into these partnerships to obtain funds to restore and enhance native forest and wildlife habitat on national wildlife refuges. FWS identifies refuge lands that are important for its overall conservation goals and manages sequestration projects on these lands, but does not play a role in the calculation, verification, or monitoring of carbon offsets. Carbon sequestration projects must support the purposes of each national wildlife refuge and be consistent with refuge forest management plans. FWS negotiates additional funding commitments with partners to meet long-term operations and maintenance needs as well.

In return for funding carbon sequestration activities related to FWS conservation goals, partners retain rights to any carbon credits that may result from the restoration projects. The partners may in turn provide their clients or donors with the opportunity to offset their carbon emissions by contributing funds to these projects. Companies involved in partnership agreements with FWS may restore or reforest refuges, or buy land identified by FWS and then gift the land back to FWS and underwrite the restoration of that land. Partners include energy companies and nonprofit land trusts. According to FWS, these partnerships have led to the addition of 40,000 acres of land to the refuge system and restored a total of 80,000 acres of wildlife habitat with more than 22 million trees. The Solicitor's Office of the Department of the Interior determined that FWS may accept

donations of this kind as long as it complies with the Department of the Interior's guidelines for accepting donations and applicable laws and regulations.

- Environmental Protection Agency

The mission of the Environmental Protection Agency is to protect human health and the environment. EPA Climate Leaders, a voluntary emissions reduction program, provides technical assistance to companies on calculating and tracking greenhouse gas emissions over time, calculating emissions reductions from offsets, and incorporating offsets into emission reduction strategies. In the Climate Leaders program, partner companies commit to reduce their impact on the environment by completing a greenhouse gas emissions inventory, setting reduction goals, and annually reporting progress to EPA. EPA also provides guidance to partners on calculating emissions reductions from offsets. For offsets to be credible, according to EPA, they must meet four key accounting principles: the offsets must be real, additional, permanent, and verifiable. Partners may choose to develop their own offset projects or purchase offsets. Offset projects must meet Climate Leaders requirements for use toward meeting a greenhouse gas reduction goal, including the use of a performance standard-based approach to quantifying emissions reductions. EPA has developed accounting methodologies for certain offset project types, including landfill gas, manure management, afforestation, transportation, and boiler replacement projects. EPA is also developing protocols for additional project types, such as coal bed methane.

- Federal Trade Commission

The mission of the Federal Trade Commission is to protect consumers, strengthen free and open markets, and promote informed consumer choice. The Federal Trade Commission Act prohibits unfair or deceptive trade practices, including deceptive advertising. Among other things, the FTC enforces a wide variety of consumer protection laws and is evaluating the treatment of carbon offsets in its *Green Guides*, a publication designed to help advertisers avoid making false or misleading environmental marketing claims.¹⁹ The FTC announced in November 2007 that it would conduct a regulatory review of the *Green Guides*, which were last updated in 1998 and do not currently address carbon offsets. According to the FTC,

¹⁹FTC, Guides for the Use of Environmental Marketing Claims 16 C.F.R. Part 260.

carbon offset marketing claims may present a heightened potential for deception because it is difficult, if not impossible, for consumers to verify the accuracy of the seller's claims. The FTC held a public workshop in January 2008 about carbon offsets to obtain input on consumer protection issues and to determine whether more direct guidance is needed. The workshop examined the emerging market for greenhouse gas emission reduction products and related advertising claims, among other issues. The FTC is reviewing the public comments obtained through the workshop but has not issued proposed changes to the guides and has not decided whether to issue guidance specifically regarding offsets.

- U.S. House of Representatives, Office of the Chief Administrative Officer

The Office of the Chief Administrative Officer provides operations infrastructure and support services for the community of about 10,000 House Members, officers, and staff. The CAO purchased 30,000 metric tons of offsets through the Chicago Climate Exchange as part of the Green the Capitol Initiative, an effort to reduce the greenhouse gas emissions from House operations. Among other measures, the Green the Capitol Initiative outlines three strategies, including (1) purchasing electricity generated from renewable sources; (2) meeting the House's heating and cooling needs by switching from using coal, oil, and natural gas at the Capitol power plant to natural gas only; and (3) purchasing offsets to compensate for any remaining carbon emissions. See appendix IV for more information about the purchase of offsets by the CAO.

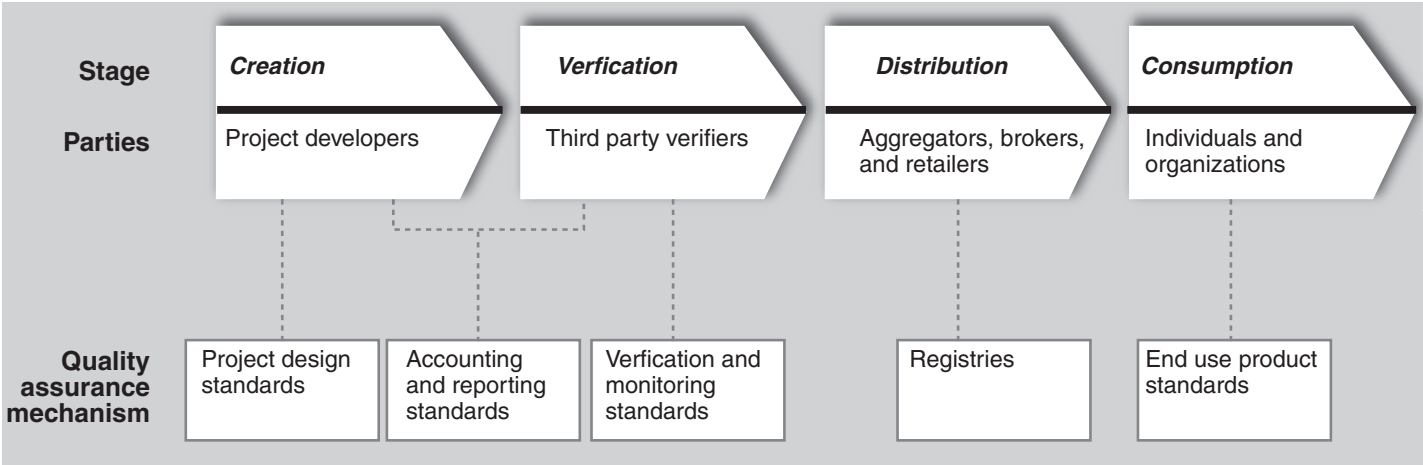
A Variety of Quality Assurance Mechanisms Are Available and Used, but Information on the Credibility of Offsets Is Limited

Multiple quality assurance mechanisms are available and used to ensure the credibility of carbon offsets available for purchase on the U.S. voluntary offset market, but a lack of centralized information makes it difficult to estimate the extent of their use. Participants in the offset market face several challenges to ensuring the credibility of offsets, including problems determining additionality, and the availability and use of many mechanisms for verification, and monitoring. Our purchase of offsets found that the information supplied by a nonprobability sample of retailers provides limited assurance of credibility.

Quality Assurance Mechanisms Are Available and Applied to Offset Projects, but the Extent of Their Use Is Uncertain

A wide range of quality assurance mechanisms, commonly described collectively as “standards,” are available to ensure the credibility of carbon offsets. Market participants and third parties apply these standards at different stages of the carbon offset supply chain for a variety of purposes. For example, accounting and reporting methods define how to measure emissions reductions from specific types of projects. In addition, verification and monitoring standards are used to confirm that offsets are calculated correctly and that a project was indeed implemented, and to monitor progress over time. End use product standards, applied later in the supply chain, can be used to certify product marketing claims. Certain mechanisms cover multiple aspects of quality assurance and specify the use of registries to track the ownership and disposition of offsets, while others focus on one aspect, such as ensuring that emissions reductions are calculated correctly. Figure 7 illustrates how quality assurance mechanisms relate to the various components of a simplified offset supply chain, and appendix VII describes selected offset standards used in the voluntary market.

Figure 7: Quality Assurance Mechanisms in a Simplified Carbon Offset Supply Chain



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

Our review of the available literature and discussions with stakeholders identified widely varying estimates of the extent to which market participants use quality assurance mechanisms. Available information suggests that many carbon offsets in the voluntary market were subject to a quality assurance mechanism, but the fragmented nature of the market and limited data preclude exact estimates of the use of such mechanisms. One study estimated that more than 85 percent of the offsets purchased on

the retail market in 2007 were verified by third parties, but this estimate did not include data on verification for many transactions.²⁰ In contrast, another study stated that the majority of voluntary offsets are currently not certified against a third party standard.²¹ The available information suggests that fewer providers use registries to track the ownership and disposition of offsets than use third party verification or other quality assurance mechanisms. For example, one study estimated that more than 50 percent of the offsets available on the retail market were not listed in a registry, but this estimate did not include data for many transactions.²² Because of incomplete and conflicting data on the use of quality assurance mechanisms, including registries, we cannot accurately gauge the extent of their use. In addition, these data limitations detract from the market's transparency.

Market Participants Face Challenges in Ensuring the Credibility of Offsets

Our interviews with stakeholders identified additionality and the presence of many different verification and monitoring methods as the two greatest challenges facing participants in the market. This is important because stakeholders and the available literature identify additionality and verification and monitoring as among the most important characteristics for establishing the credibility of offsets.²³ (See app. V for more information about stakeholders' ratings of characteristics of offset credibility and market challenges.)

According to most stakeholders and key studies, additionality is fundamental to the credibility of offsets because only offsets that are additional to business-as-usual activities result in new environmental benefits. However, certain stakeholders said that additionality is not a critical factor at this early stage in the development of carbon markets and that the key goal should be to keep transaction costs and barriers to entry low to create financial incentives for reducing emissions. Several stakeholders said that there is no correct technique for determining

²⁰Hamilton, Sjardin, Marcello, and Xu, *Forging a Frontier*.

²¹Anja Kollmuss, Helge Zink, and Clifford Polycarp, *Making Sense of the Voluntary Carbon Market: A Comparison of Carbon Offset Standards* (Stockholm Environment Institute and Tricorona: March 2008).

²²Hamilton, Sjardin, Marcello, and Xu, *Forging a Frontier*.

²³Stakeholders who responded to our questions also identified the concept of "leakage"—the possibility that emissions increase elsewhere as a result of the implementation of a carbon offset project—as a challenge, which we address later in this report.

additionality because it requires comparison of expected reductions against a projected business-as-usual emissions baseline (also referred to as a counterfactual scenario). 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.

Stakeholders offered different definitions for additionality and preferred different methods for determining whether projects are additional. For example, some stakeholders said that additionality should be evaluated on a case-by-case examination of the unique circumstances of each project, while other stakeholders preferred evaluating projects against efficiency standards for a technology or sector, known as a performance benchmark approach. There are many other ways to determine 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. See table 2 for descriptions of selected additionality tests.

Table 2: Descriptions of Selected Additionality Tests

Additionality test	General description
Barriers	The underlying assumption of this test is that the production of offsets is a decisive reason that a project is able to overcome significant implementation barriers, such as local resistance to new technologies. Under other versions of the test, at least one alternative of the project must be shown not to face such barriers.
Common practice	To meet this test, an offset project must reduce emissions below levels produced by “common practice” technologies that provide the same products and services as the project. If the project does not meet the test, the assumption is that offsets are not a decisive reason for pursuing the project.
Investment, or financial	The most common version of this test (often termed financial additionality) assumes an offset project to be additional if it can be demonstrated that the project would have a lower than acceptable rate of return without revenue from offsets. The underlying assumption is that offsets must be a decisive reason for implementing a project that is not an attractive investment without revenues associated with those offsets. Under some versions of this test, an offset project with a high or competitive rate of return could still be additional, but must demonstrate additionality through other means.

Additionality test	General description
Legal, regulatory, or institutional	To satisfy this test, an offset project must reduce emissions below the level required by any official policies, regulations, guidance, or industry standards. If it does not reduce emissions beyond these levels, the assumption is that the only real reason for pursuing the project is compliance and the project, therefore, is not additional. Under some versions of this test, the converse is true—if the project reduces emissions beyond required levels, it is assumed that the only reason for pursuing the project is to earn offsets, and the project is therefore additional.
Performance benchmark	To meet this test, an offset project must demonstrate an emissions rate that is lower than a predetermined benchmark emissions rate for a particular technology or practice. This test is premised on the assumption that most, if not all, projects that beat the specified benchmark are ones in which climate change mitigation is a decisive factor in the decision to exceed the benchmark. The benchmark may also be used to calculate baseline emissions.
Project in, project out	This test reviews whether an offset project results in lower emissions than a scenario in which the project had not been implemented. If emissions associated with the project are lower than the business-as-usual scenario, then it is assumed that reducing emissions was a decisive reason for the project and that the project is additional.
Technology	The offset project and its associated reductions are considered additional if the offset project involves a technology specified as not being business as usual. The default assumption is that for these “additional” technologies, offsets are a decisive reason for using the technology in a particular project.
Timing	In this test, an offset project must have been initiated after a certain date, such as the date of initiation of a compliance program. The assumption is that any project started before that date must have had motivations other than offsets. Under most versions of this test, projects started after the required date must also establish additionality through a second test.

Source: GAO analysis of Dr. Mark C. Trexler, Derik J. Broekhoff, and Laura H. Kosloff. “A Statistically-Driven Approach to Offset-Based GHG Additionality Determinations: What Can We Learn?” Sustainable Development Law and Policy, Vol. VI, Iss. 2 (Winter 2006): 30-40.

Note: This table summarizes and introduces the variety of additionality tests that have been circulated over the past decade. It is not an exhaustive list of additionality tests, nor is it intended to provide precise definitions of the different tests.

Stakeholders also identified the existence of many different verification and monitoring methods as a key challenge to ensuring the credibility of offsets. There are many standards for measuring, verifying, monitoring, and tracking the distribution of carbon offsets 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. In addition, several stakeholders said that a standardized offset registration process would foster transparency and prevent double-counting. Because there is no single registry and because of a lack of communication among existing registries, it is difficult for consumers to determine the quality of the offsets they purchase.

Certain stakeholders said that a single standard would bring greater credibility to the voluntary carbon offset market and result in projects that meet more stringent protocols. However, some stakeholders said that they did not expect that a single standard would emerge because of the wide variety and complexity of offset projects. Further, several stakeholders said that a single standard may not be desirable because it could stifle innovation and limit access to the market. Certain stakeholders said that the flexibility offered by multiple standards encourages the testing of new methodologies and emissions reduction technologies.

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.²⁴ Some stakeholders also pointed out that projects that use future value accounting practices to calculate offsets may be less credible. However, certain stakeholders said that this does not mean such projects should be categorically excluded from the offset market, only that they may require more rigorous quality assurance. Approximately one-third of the respondents said that credibility varies depending upon circumstances specific to the project. See table 5 in appendix V for more details about

²⁴Renewable energy certificates certify that a certain quantity of electricity has been generated from a qualifying type of renewable generation technology.

stakeholders' rating of the credibility of different types of carbon offset projects.

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 RECs, forestry, and agricultural and rangeland soil carbon projects face challenges related to additionality, measurement, and permanence. According to several stakeholders, RECs and carbon offsets are not comparable environmental commodities and differ in their objectives, the actions they represent, and the standards by which they are defined. RECs certify that a certain quantity of electricity has been generated from a qualifying type of renewable generation technology, whereas carbon offsets represent an amount of carbon reduced in comparison with a projected business-as-usual emissions baseline. RECs may be bought and sold to satisfy state-level requirements to produce electricity from renewable sources—known as renewable portfolio standards—and also in the voluntary carbon offset market. The carbon benefits of RECs may be double-counted if sold in both markets, according to some stakeholders. 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.

Projects using future value accounting practices to calculate offsets may also be less credible than those that do not, according to some stakeholders. 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. Some stakeholders told us that future value accounting practices expose consumers to more risk that the offsets will not materialize because it is more difficult to verify and monitor such projects over time. Other stakeholders said that future value accounting is an important way to fund certain types of offset projects that might otherwise not be possible.

Information Provided to Consumers Offers Limited Assurance of Credibility

The information provided to consumers about offset projects and quality assurance mechanisms offers limited assurance of credibility, according to certain stakeholders and analysis of documents obtained through the purchase of offsets. Several studies and stakeholders said that it is difficult for consumers to make educated choices about offset purchases because the information they need may not be provided by retail offset providers.

However, one stakeholder said that the strengths and weaknesses of offsets could be determined with a reasonable amount of due diligence, which is important to any buyer of a commodity in an emerging market.

To better understand the perspective of consumers, we purchased offsets from 33 retail providers and found that the information provided about the offsets varied considerably and offered limited assurance of credibility. We retrospectively analyzed information provided to us by the retailers directly as a result of the transaction as well as information provided on their Web sites. We expected that the information provided by retailers as a result of the transaction would yield detailed project-specific information related to credibility, and our review of Web sites was intended to supplement the information received directly from providers as a result of transactions. We found that retailers provided limited information about important characteristics for establishing the credibility of offsets, including additionality, verification, and the use of a registry to track offsets. We also found that few retailers identified specific projects associated with our transactions, and that the information provided on Web sites—in some cases general information about the retailers' quality assurance approaches—could not be linked to particular transactions. As a result, we found it difficult, in many cases, to determine exactly what we had purchased, and consumers in the offset market may face similar challenges.

With respect to information provided directly as a result of a transaction, 3 of 33 retailers said that their offsets were additional but only 2 explained how they defined additionality. The remaining 30 retailers did not provide information on additionality. With regard to verification, less than one-third of retailers (9 of 33) specified that their offsets were verified by a third party. The remaining 24 retailers did not provide information on verification. In addition, 5 of 33 retailers specified that the offsets were tracked in a registry and included the name of the registry, and 4 of these provided associated tracking numbers. The remaining 28 retailers did not provide information about the use of a registry. Further, as a direct result of the transaction, less than half of the retailers (13 of 33) provided information about whether the transaction resulted in the exchange of a good or the provision of a service.

We also found that retailers provided limited information about the offset projects associated with our transactions. Less than half (13 of 33) provided information about the location of their projects, but the majority of retailers (24 of 33) provided information on the type of project, and 9 of these retailers identified multiple project types. In addition, 8 retailers

provided information related to the timing of the project, specifically, when the project started or is scheduled to begin or when the offsets would occur.

However, many provided more information on their Web sites that was not directly related to our transactions. We found that almost all of the retailers (30 of 33) provided some information related to verification on their Web sites. This information varied considerably among the retailers, with all 30 stating that the offsets were verified and 6 providing detailed information such as verification reports. With regard to additionality, 22 retailers provided information on their Web sites, including some explanation of how they define additionality. Finally, less than half of the retailers (12 of 33) said that their offsets are tracked in a registry, including 10 retailers that identified a specific registry, and 2 that operate their own.

Both Increased Federal Oversight and the Use of Offsets in Climate Change Policies Involve Trade-offs between Cost and Credibility

Increased government oversight of the voluntary market could address some concerns about the credibility of offsets by standardizing quality assurance mechanisms and registries, and this could encourage new projects and help protect consumers. However, more oversight could reduce flexibility and increase the administrative burden for government agencies and providers, which could raise costs and stifle innovation. Using offsets in a mandatory emissions reduction program would involve similar trade-offs. Offsets could lower the cost of compliance, encourage investment and innovation in sectors not required to reduce emissions, and provide time for regulated entities to change existing technologies. However, if the offsets used for compliance are not credible, the environmental integrity of a compliance system may be compromised.

More Oversight of the Voluntary Market Involves Trade-offs between Credibility and Cost

Increased oversight could address some concerns about the credibility of offsets by standardizing the use of quality assurance mechanisms and registries. Some stakeholders said that the voluntary offset market cannot operate efficiently without standardized mechanisms for ensuring the credibility of offsets. More government oversight could also help increase the fungibility and commoditization of offsets and improve the market's transparency. Other benefits of oversight and standardization could include encouraging the development of new projects, improving consumer protection and awareness, and addressing concerns about weaknesses of the voluntary market spilling over into a future compliance market. Certain stakeholders said that enhanced oversight of the voluntary carbon market would provide it with increased legitimacy that would help to spur new offset projects and increase the size of the market.

On the other hand, increased oversight would likely increase the cost of providing offsets in the voluntary market by introducing complex quality assurance requirements, which reduce flexibility and increase transaction costs. Oversight could also stifle innovation, according to some stakeholders, by requiring complex procedures with greater administrative costs, and by excluding some types of offset projects from the market. The federal government could also incur costs associated with increased oversight activities.

Stakeholders held different opinions about whether the government should play a larger role in the U.S. voluntary market. Several said that organizations have already invested time, money, and expertise in developing standards and that increased oversight should rely on and build on these investments. Other stakeholders thought that standardized quality assurance methods and registries would evolve naturally over time as the result of market forces. Several stakeholders said that government should focus on creating a mandatory greenhouse gas reduction program instead of improving the voluntary market and that a future compliance market will largely drive the standards for the voluntary market.

Certain stakeholders and available studies illustrated several policy options for enhancing oversight of the market. One option would involve requiring participants in the market to adopt standardized quality assurance mechanisms and use a specific registry. A second option would involve the federal government providing incentives or developing voluntary programs to encourage participants to take certain actions. Other options include prohibiting certain types of projects that are considered less credible and applying discounts or imposing insurance requirements on certain types of offsets with greater uncertainty or potential for failure. As an example of government oversight in the voluntary offset market, several stakeholders mentioned the United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) framework for the Code of Best Practice for Carbon Offsetting. The code is designed to increase consumer confidence in the integrity of carbon offsets available for purchase in the United Kingdom. Offset products meeting the requirements of the code will be assigned a certification mark that providers may use for marketing purposes. The code initially covers only Certified Emissions Reductions that are compliant with the Kyoto Protocol, but voluntary emissions reductions could be included in the code in the future.

Offsets Could Lower the Cost of Future Mitigation Policies but Increase Uncertainty about Achieving Emissions Reductions

Allowing offsets in a future compliance scheme could decrease the overall compliance costs because it could provide regulated entities with a wider variety of compliance options. In many cases, regulated entities may find it economically advantageous to buy offsets instead of reducing emissions themselves. Recent EPA analyses state that the cost of compliance with mitigation policies under consideration by the Congress decreases substantially as the use of offsets increases. Specifically, the agency's recent analysis of the Climate Security Act of 2008 (S. 2191) 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.²⁵ Alternatively, the price increases by an estimated 93 percent compared to the bill as written if no offsets are allowed. A 2007 EPA study analyzing the economic impacts of the Climate Stewardship and Innovation Act of 2007 (S. 280) found similar results.²⁶ Other quantitative studies by economists also show that the use of offsets will decrease the cost of achieving emissions reductions.²⁷ 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.²⁸ Using offsets in a compliance scheme could also increase the administrative costs of the scheme because of increased government oversight of quality assurance mechanisms used to ensure the credibility of offsets.

A lower carbon price due to the availability of offsets as a compliance tool may have several effects, according to available economic literature. In the short term, lower prices make compliance with a policy to reduce emissions less expensive. Lower prices may also facilitate agreements to

²⁵See EPA Analysis of the Lieberman-Warner Climate Security Act of 2008, S.2191 in the 110th Congress (March 2008), available at <http://www.epa.gov/climatechange/economics/economicanalyses.html>.

²⁶See EPA Analysis of the Climate Stewardship and Innovation Act of 2007, S.280 in the 110th Congress, (July 2007), available at <http://www.epa.gov/climatechange/economics/economicanalyses.html>.

²⁷See EIA analysis of the Climate Stewardship and Innovation Act of 2007, S.280 in the 110th Congress (July 2007), available at <http://www.eia.doe.gov/oiaf/servicert/csia/>. See also Congressional Research Service Report for Congress, *Climate Change: Costs and Benefits of S.2191*, which analyzes the role of offsets in six different quantitative economic models of the Lieberman-Warner Climate Security Act of 2008, S.2191 in the 110th Congress (July 2008).

²⁸EPA analyses and other economic literature generally evaluate cap-and-trade compliance systems as opposed to other policy options.

limit emissions and enhance their environmental integrity by reducing the incentive for regulated sources to either cheat on the agreement or shift production to areas where carbon emissions are not regulated.²⁹ Including offsets in compliance schemes could also encourage investment and innovation in unregulated sectors of the economy, possibly at the expense of investment and innovation in regulated sectors.³⁰ According to several stakeholders and available economic literature, a market for offsets may support climate-related innovation in sectors that supply offsets. For example, unregulated facilities may devise new ways to limit greenhouse gas emissions because they could sell offsets in the compliance market.

The availability of offsets in a compliance scheme could also provide time for regulated facilities to develop new technologies and processes. Some stakeholders said that access to offsets provides more flexibility in meeting short-term requirements, leaving more time to implement long-term plans for internal emissions reductions and technology development. Further, according to certain stakeholders, offsets may allow regulated sources to continue using assets such as power plants until the end of their useful lives, thereby reducing their premature retirement and the cost of emissions reductions overall. In addition, multiple stakeholders said that offsets may allow covered sources to avoid investing in long-lived assets that achieve only marginal improvements, instead focusing on more effective assets that take longer to develop.

On the other hand, allowing the use of offsets could compromise the environmental integrity of a compliance system if nonadditional offsets are used as compliance tools. Certain stakeholders said that because offset programs increase the total quantity of compliance instruments available to regulated sources, the integrity of the system can be maintained only if offsets are additional. 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

²⁹See Judson Jaffe and Robert Stavins. "Linking a U.S. Cap-and-Trade System for Greenhouse Gas Emissions: Opportunities, Implications, and Challenges." American Enterprise Institute Center for Regulatory and Market Studies, Working Paper 08-01 (January 2008).

³⁰See Jaffe and Stavins (2008), and Joseph Kruger, Wallace E. Oates, and William A. Pizer. "Decentralization in the EU Emissions Trading Scheme and Lessons for Global Policy." *Review of Environmental Economics and Policy*, Vol. 1, Iss. 1 (winter 2007).

assurance mechanisms to ensure the credibility of any offsets allowed into a compliance scheme. In addition, these concerns could be minimized by limiting 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.

The available economic literature supports some of the environmental integrity concerns raised by stakeholders. Economic analyses of offsets acknowledge difficulties with their use, including baseline determination, additionality, permanence, double-counting, and verification and monitoring.³¹ If these criteria are more likely to be satisfied by internal reductions from regulated sources than by offsets, the use of offsets may result in greater emissions, according to these sources. Economists have also identified “leakage” as a potential problem for offsets, especially those created on a project-by-project basis. Leakage occurs when economic activity is shifted as a result of emission control regulation. Consequently, emissions abatement achieved in one location that is subject to emission control regulation is diminished by increased emissions in unregulated locations. For an offset project, leakage occurs when economic activity is shifted from the site of the offset project to another location or sector where emissions are not controlled. For example, an offset project that restricts timber harvesting at a specific site may boost logging at an alternative location, thus reducing the effectiveness of the offset project. Forestry projects are thought to be particularly vulnerable to these challenges, as are credits originating in developing countries, even though these offsets have been identified as sources of significant cost savings to compliance regimes in developed countries.³²

Multiple stakeholders also said that including offsets in a compliance scheme could slow investment in certain emissions reduction technologies

³¹For example, see Jaffe and Stavins (2008), and Kruger, Oates, and Pizer (2007). See also Carolyn Fischer. “Project Based Mechanisms for Emissions Reductions: Balancing Trade-offs with Baselines,” RFF DP 04-32, Resources for the Future (August 2004).

³²A recent report by the Congressional Research Service discusses the potential and drawbacks of incorporating forestry projects into carbon markets. See *Forest Carbon Markets: Potential and Drawbacks*, RL34560 (Washington, D.C.: July 3, 2008). Other related Congressional Research Service reports include *Voluntary Carbon Offsets: Overview and Assessment*, RL34241 (Washington, D.C.: Nov. 7, 2007), and *The Role of Offsets in a Greenhouse Gas Emissions Cap-and-Trade Program: Potential Benefits and Concerns*, RL34436 (Washington, D.C.: Apr. 4, 2008).

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. For example, a senior representative of the Council on Environmental Quality said that there is a trade-off between short-term focus on the marginal cost of reductions and long-term investment in technology. This representative said that offsets may be a cheaper way to reduce emissions today, but that investment in technology, not offsets, builds emissions reductions into the economy for the long term. Other stakeholders and the available economic literature raise similar concerns. According to the literature, a market for offsets may support innovation in sectors that supply offsets at the expense of investment in technology to reduce emissions from regulated sources. Furthermore, certain stakeholders said that it may be more difficult for regulators to mandate the amount and timing of emissions reductions in specific economic sectors if offsets are part of a compliance scheme.

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.

Existing international programs to limit greenhouse gas emissions that allow the use of offsets for compliance may provide insights into trade-offs between cost and credibility. For example, the European Union's program to limit greenhouse gas emissions enables regulated entities to use certain types of offsets for compliance. GAO is reviewing the European Union's program, including the role of offsets, in a report that we will issue later in 2008.

Concluding Observations

The voluntary market for carbon offsets provides a potentially low-cost way for purchasers of offsets to compensate for their emissions of greenhouse gases by paying others to undertake activities that avoid, reduce, or sequester greenhouse gas emissions. However, several factors contribute to challenges in understanding the market. First, while most markets involve tangible goods or services, the carbon 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. Second, ensuring the credibility of carbon offsets poses challenges because of the inherent uncertainty in measuring emissions reductions or sequestration relative to a projected business-as-usual scenario. Any measurement involving projections is inherently uncertain. These challenges are compounded by the fact that project developers produce offsets from a variety of activities—such as sequestration in agricultural soil, and forestry projects, and methane capture—and do not use a single set of commonly accepted quality assurance mechanisms. Third, many transactions do not involve a central trading platform, exchange, or registry system. These factors limit the market’s transparency and pose challenges for market participants, especially consumers.

Additional oversight of the voluntary market could address some of these challenges, but would also impose costs on government oversight bodies and increase costs for market participants. Some options for increased oversight include requiring the use of standard quality assurance mechanisms, mandating the use of a common registry, establishing product disclosure requirements that help consumers evaluate an offset’s quality, establishing best practices, developing a government certification system, providing incentives or developing voluntary programs to encourage participants to take certain actions, and limiting the allowable types of activities that can generate offsets. Consideration of these approaches involves trade-offs among cost, quality assurance, and consumer protection. The Federal Trade Commission’s efforts to update its Green Guides for environmental marketing claims may also enhance the existing oversight framework, which consists primarily of laws affecting contractual agreements and fraud.

The options for enhanced oversight identified above may increase in importance in the context of a compliance market associated with any future policies that place binding limits on greenhouse gas emissions. While allowing carbon offsets for compliance with mandated reductions in emissions can decrease overall compliance costs for regulated entities, challenges with the credibility of offsets could compromise the integrity of a compliance scheme. In addition to the oversight options identified above, the government could consider further steps to address uncertainties with offsets such as limiting the extent of their use for

compliance, discounting a percentage of all offsets, and imposing insurance requirements for offset providers and purchasers.

Matter for Congressional Consideration

GAO is not recommending executive actions. However, as the Congress considers legislation intended to limit greenhouse gas emissions that allows the use of carbon offsets for compliance, it may wish to incorporate provisions that would direct the relevant federal agency (or agencies) to establish (1) clear rules about the types of offset projects that regulated entities can use, 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.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to others who are interested and make copies available to others who request them. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or stephensonj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix VIII.



John B. Stephenson
Director, Natural Resources
and Environment

List of Requesters

The Honorable Joe Barton
Ranking Member
Committee on Energy and Commerce
House of Representatives

The Honorable Tom Davis
Ranking Member
Committee on Oversight and Government Reform
House of Representatives

The Honorable Vernon J. Ehlers
Ranking Member
Committee on House Administration
House of Representatives

The Honorable Darrell Issa
Ranking Member
Subcommittee on Domestic Policy
Committee on Oversight and Government Reform
House of Representatives

The Honorable John Shimkus
Ranking Member
Subcommittee on Oversight and Investigations
Committee on Energy and Commerce
House of Representatives

Appendix I: Objectives, Scope, and Methodology

This report examines (1) the scope of the U.S. voluntary carbon offset market, including the role of the federal government; (2) the extent to which mechanisms for ensuring the credibility of voluntary carbon offsets are available and used, and what, if any, related information is shared with consumers; and (3) the trade-offs associated with increasing the oversight of the U.S. voluntary carbon offset market and incorporating offsets into broader climate change mitigation policies.

In conducting our work, we reviewed available government and trade literature related to carbon offset markets and conducted structured and open-ended interview questions with nonprobability samples of 34 stakeholders, including 12 providers, 3 third party verifiers, 7 developers of standards, and 12 other knowledgeable stakeholders. We selected nonprobability samples of relevant stakeholders based on analysis of existing market literature, referrals from other stakeholders, and other criteria, such as participation in carbon offset trade conferences.¹ In general, we selected stakeholders that were frequently cited in available studies of the offset market or participated in related conferences and meetings, and preferentially selected stakeholders based in the United States. We also conducted scoping interviews with several trade groups and other knowledgeable stakeholders.

To describe the scope of the U.S. voluntary carbon offset market, including the role of the federal government, we interviewed officials responsible for offset-related programs at the Department of Agriculture (Forest Service), the Department of Energy (Energy Information Administration), the Department of the Interior (U.S. Fish and Wildlife Service), and the Environmental Protection Agency, and officials at the Federal Trade Commission and the Commodity Futures Trading Commission. To obtain an official administration position on carbon offsets, we met with the Council on Environmental Quality. We attended public meetings and congressional briefings and attended several conferences focused on the voluntary carbon offset market. We met with officials responsible for managing state and regional greenhouse gas mitigation programs, including California's recently passed legislation to regulate greenhouse gases (Assembly Bill 32), the Regional Greenhouse Gas Initiative (RGGI), and the Western Climate Initiative. We met with

¹Nonprobability samples cannot be used to generalize or make inferences about a population. In this instance, we cannot generalize the results of our interviews to all carbon offset market participants.

representatives of the Chicago Climate Exchange, the Chief Administrative Officer of the House of Representatives, and other officials involved in the purchase of carbon offsets for the House of Representatives. To obtain perspectives on the role of the voluntary offset market in comparison and as a complement to compliance markets, we interviewed officials at the United Kingdom (UK) Department for Environment, Food and Rural Affairs (DEFRA). We also met with the UK National Audit Office, and a variety of other offset market participants and stakeholders in the UK. To obtain specific information about the supply of offsets in the United States, including the number and type of offset projects and the quantity of offsets by state, we analyzed data purchased from Point Carbon, a provider of independent news, analysis, and consulting services for European and global power, gas, and carbon markets. Data presented in this report on the supply of offsets refer specifically to offsets generated from projects located in the United States. Point Carbon estimates that its database accounts for approximately 80 percent of the offsets generated from projects located in the United States based on its analysis of domestic and global carbon markets. As such, our analysis may not have included all projects that are operating in the United States; however, we believe these data represent the best information available. To assess the reliability of the Point Carbon data, we (1) performed electronic testing of required data elements, (2) reviewed existing information about the data and the system that produced them, and (3) interviewed Point Carbon staff who are knowledgeable about the data. We determined that the data were sufficiently reliable for the purposes of this report.

To analyze the extent to which mechanisms for ensuring the credibility of voluntary carbon offsets are available and used, and what, if any, related information is shared with consumers, we obtained about \$100 worth of offsets from each of a nonprobability sample of 33 retail providers for a total expenditure of approximately \$3,300. The information we obtained from the nonprobability sample of purchases does not address how the market may evolve over time or how consumers interpret the information they receive from providers. To select the sample of retailers from whom offsets would be obtained, we used available information to identify providers that sold or accepted donations for offsets online. To select the sample of retailers, we developed a list of providers based on primary sources, including reports, studies, surveys, and lists from membership organizations. We used information from providers' Web sites to identify whether providers sold or accepted donations for offsets online and selected retailers that did and were identified in two or more primary sources. We conducted online transactions because they cater directly to individual consumers, a portion of the U.S. voluntary carbon offset market

that is not well characterized in available studies. We analyzed the documentation directly related to each transaction, including (1) transaction documents—information provided while conducting the online transaction, (2) e-mail documents—any information received through e-mail after conducting the transaction, and (3) mail documents—any information received through the mail after conducting the transaction. We analyzed the documentation directly related to the transaction, if provided, to determine whether it contained information related to volume, price, project type and location, standards, registry, verification, monitoring, additionality, timing, and ownership. We also reviewed information presented on the retailer's Web site to determine whether information was provided about the retailers' offsets related to price, project type and location, standards, registry, verification, monitoring, additionality, timing, and ownership.

To assess the trade-offs associated with increasing the oversight of the U.S. voluntary carbon offset market and incorporating offsets into broader climate change mitigation policies, we reviewed available economic literature and information collected through stakeholder responses to structured and open-ended interview questions. We conducted our work from July 2007 to August 2008.

Appendix II: Description of Offset Project Types

Project type	Description
Agricultural methane	Projects that capture and combust or contain methane produced from agricultural operations. This involves the installation of complete-mix or plug-flow digesters or lagoon covers that collect aggregated waste from dairy, avian, and/or hog sources.
Agricultural soil	Projects that sequester carbon in soil through the adoption of conservation tillage and activities such as planting grass or adopting certain tilling practices.
Carbon capture and biological storage (CCBS)	Projects that capture and sequester greenhouse gases using biological techniques such as algae lagoons.
Carbon capture and geological storage (CCGS)	Projects that separate CO ₂ emissions from industrial and energy-related emissions sources, transport the CO ₂ to a suitable storage site, and then isolate the CO ₂ by injecting it into an underground geologic formation such as active and abandoned oil and gas reservoirs, saline aquifers, or unminable coal seams.
Coal mine methane	Projects that capture and burn or contain methane emitted by coal mines.
Energy efficiency	Projects that reduce CO ₂ emissions by reducing on-site combustion of natural gas, oil, or propane for end use by improving the energy efficiency of fuel usage and/or the energy efficient delivery of energy services.
Forestry	Projects that occur on land managed in accordance with sustainable forestry practices and promote the restoration of native forests by using mainly native species and avoiding the introduction of invasive nonnative species.
Landfill methane	Projects that capture and burn or contain methane produced by landfills.
Rangeland soil	Projects that involve the adoption of certain sustainable grazing practices on rangeland that include moderate livestock density and rotational and seasonal grazing techniques.
Renewable energy	Projects that reduce emissions by generating energy from renewable sources including but not limited to hydro, wind, and solar power.
Renewable energy certificates (REC)	RECs are tradable certificates that represent the environmental attributes that result from one megawatt hour of electricity generated by a renewable source, such as wind power.

Source: GAO.

Appendix III: Volume and Number of Offset Projects by State in 2007

Range	State	Volume	Percentage of total volume	Number of projects
More than 250,000	Texas	1,830,258	18	12
	Virginia	1,680,500	16	2
	Multiple States	727,313	7	12
	Wyoming	606,082	6	4
	Georgia	532,779	5	5
	Alabama	500,000	5	2
	Illinois	464,284	5	11
	California	407,125	4	31
	Colorado	403,000	4	2
	North Dakota	400,000	4	2
	Wisconsin	294,263	3	13
100,000 to 250,000	Pennsylvania	188,063	2	13
	North Carolina	181,365	2	3
	Washington	174,080	2	3
	Oregon	168,663	2	11
	New Hampshire	156,125	2	2
	Louisiana	150,558	1	11
	New York	149,407	1	8
	Utah	121,000	1	3
	Mississippi	108,340	1	6
	Indiana	106,800	1	1
25,000 to 99,999	New Jersey	96,853	<1	6
	Michigan	94,691	<1	5
	Montana	80,410	<1	5
	Oklahoma	77,335	<1	2
	Maryland	75,000	<1	1
	Minnesota	72,165	<1	5
	Delaware	60,000	<1	1
	Maine	55,000	<1	2
	Massachusetts	53,405	<1	1
	Iowa	42,374	<1	2
	Idaho	40,773	<1	3
	Missouri	40,000	<1	2
	Tennessee	31,773	<1	2

**Appendix III: Volume and Number of Offset
Projects by State in 2007**

Range	State	Volume	Percentage of total volume	Number of projects
Less than 25,000	Kentucky	18,400	<1	4
	Arkansas	12,550	<1	6
	South Dakota	6,084	<1	2
	Vermont	1,639	<1	2
	Alaska	360	<1	1
	Florida	130	<1	1
	Hawaii	90	<1	1
	Arizona	0	0	0
	Connecticut	0	0	0
	District of Columbia	0	0	0
	Kansas	0	0	0
	Nebraska	0	0	0
	Nevada	0	0	0
	New Mexico	0	0	0
	Ohio	0	0	0
	Rhode Island	0	0	0
	South Carolina	0	0	0
	West Virginia	0	0	0

Source: GAO analysis of Point Carbon data.

^aTwelve projects occur across multiple states. The data for these projects are included under the category of multiple states and not included in the volume or number of projects for the individual states involved in these projects.

Appendix IV: Description of the Purchase of Carbon Offsets by the Chief Administrative Officer of the House of Representatives

On March 1, 2007, the Speaker and Majority Leader of the U.S. House of Representatives and Chairwoman of the Committee on House Administration directed the House Chief Administrative Officer (CAO) to develop a Green the Capitol Initiative to provide an environmentally responsible and healthy working environment for House employees. Among other measures, the CAO's June 21, 2007, report recommended that the House operate in a carbon neutral manner by the end of the 110th Congress and identified three strategies to achieve this goal, including (1) purchasing electricity generated from renewable sources; (2) meeting the House's heating and cooling needs by switching from using coal, oil, and natural gas at the Capitol power plant to natural gas only; and (3) purchasing offsets to compensate for any remaining carbon emissions. According to the CAO, using strategies one and two, the House would need to offset 24,000 short tons of carbon dioxide emissions to operate in a carbon neutral manner.¹

The CAO recommended purchasing carbon offsets through the Chicago Climate Exchange (CCX), a voluntary greenhouse gas reduction and trading system through which members make commitments to decrease their emissions. If CCX members reduce emissions beyond their reduction goals, they may sell the extra reductions to other members of the exchange. In addition to emitting members, the CCX platform is also available to offset providers, who may register tons on CCX that represent greenhouse gas mitigation projects. To meet their commitments, CCX members may trade emissions reductions or offsets known as Carbon Financial Instruments (CFI).² According to CCX, to verify the validity of offsets offered for sale on the exchange, and ensure that the underlying offset projects conform to CCX rules, all tons registered for sale on the CCX platform from offset projects must have been verified by CCX-approved outside verifier firms that are specialized in particular fields. The outside verification firms are to ensure that the projects are in accordance with CCX eligibility rules and methodologies, verify that projects have been implemented, conduct on-site inspections, and send verification reports to CCX. CCX staff and, in certain cases, the CCX Offsets Committee, review the verification reports and request corrective actions, if necessary. After completion of any corrective actions, CCX sends the

¹The Green the Capitol Initiative report presents data in English short tons. One short ton equals 2,000 pounds.

²Carbon Financial Instruments are contracts equal to 100 metric tons of carbon dioxide equivalent that are traded on the Chicago Climate Exchange.

verification reports to the Financial Industry Regulatory Authority (FINRA) for a final review to ensure project verification documentation is complete.³ Uniquely serialized Carbon Financial Instruments based on these offsets are then issued to the project owner's CCX registry account, and may then be sold in the CCX market. The market participants' registry accounts help the market participant track purchases and sales of offsets acquired or sold on the exchange that can be used to identify specific information about the offset projects, including verification documents. According to CCX, all participants have the option of buying CFIs anonymously and all transaction prices must be reported so that CCX can post prices on its trading platform.

The House Appropriations Committee, in its June 19, 2007, report on the 2008 Legislative Branch Appropriations Bill, stated: "The Committee believes it is important to offset greenhouse gases generated by the House. In that regard, the Committee requests the Chief Administrative Officer purchase Carbon Financial Instruments to offset carbon produced by all House operations. These offsets should be fully transparent, verified, American, project-based offset credits."⁴ The CAO requested and received approval from the Committee on House Administration on August 29, 2007, to purchase offsets and submit an application to CCX with the necessary fee. According to CAO officials, CCX was the best option for the House because it is well established relative to the rest of the industry, has clear verification and monitoring standards, and allows for the anonymous purchase of offsets. The CAO requested that CCX conduct a blind auction because the CAO did not want to decide or know which projects were selected. According to the CAO, this approach was adopted to eliminate any opportunity for House funds to be used to benefit one geographical region or congressional district over another. For example, the CAO decided not to purchase offsets on the retail market from domestic nonprofit groups because a decision to select specific vendors or offset projects in one location instead of another could be construed as a political act. On October 23, 2007, CCX made a public announcement to potential sell-side market participants that it would hold the reverse

³The Financial Industry Regulatory Authority is the largest nongovernmental regulator for all securities firms doing business in the United States. It was created in July 2007 through the consolidation of the National Association of Securities Dealers (NASD) and the member regulation, enforcement, and arbitration functions of the New York Stock Exchange. FINRA's predecessor was established pursuant to the Maloney Act, which was passed by Congress in 1938.

⁴See H.R. Rep. No. 110-198 at 10 (2007).

auction on behalf of the House of Representatives and stipulated that the projects sought had to be verified and approved CCX projects undertaken in the United States. The auction closed on November 1, resulting in the purchase of 30,000 metric tons for a total of \$90,550 including transaction fees. Results of the auction were announced at a public ceremony on November 5, 2007.

The CAO bought offsets before implementing the emissions reduction strategies specified in the Green the Capitol Initiative. Based on calculations performed for the Green the Capitol Initiative report by the Department of Energy and the Lawrence Berkeley National Laboratory, the carbon footprint of the House is approximately 91,000 short tons. According to the CAO, until the Architect of the Capitol's metering program is complete, in March 2009, House emissions data are based on historical estimates. To reach the goal of carbon neutrality, the Green the Capitol Initiative called for two emissions reduction strategies and the purchase of carbon offsets to compensate for whatever emissions remained. Purchasing electricity generated from renewable sources would decrease emissions to 34,000 short tons. Switching from burning coal, oil, and natural gas at the Capitol power plant to burning only natural gas would further decrease emissions to 24,000 short tons. The third strategy to reach the goal of carbon neutrality was to purchase offsets for the remaining carbon emissions—24,000 short tons. However, the first two strategies had not been completed when the CAO purchased offsets through CCX in November 2007. Concerning the first two strategies, the Architect of the Capitol purchased renewable energy in June 2008, and the CAO, in written comments, told us that the Architect of the Capitol had purchased natural gas to account for the House's portion of energy used at the Capitol Power Plant. According to the CAO, there was no benefit to waiting to purchase offsets.

The CAO used data from 2006 that GAO developed as part of a broader characterization of greenhouse gas emissions from legislative branch agencies and later analyzed by Lawrence Berkeley National Laboratory to identify the amount of offsets the CAO would purchase to reach its goal of carbon neutrality by the end of 2008.⁵ The CAO stated that it does not have current emissions data and that the Architect of the Capitol does not have

⁵GAO, *Legislative Branch: Energy Audits Are Key to Strategy for Reducing Greenhouse Gas Emissions*, [GAO-07-516](#) (Washington, D.C.: Apr. 25, 2007). GAO's analysis identified the amount of greenhouse gas emissions generated by legislative branch operations.

meters that enable it to directly monitor its energy use or emissions in real time. According to the CAO, emissions data projected from a 2006 baseline provide a reasonable estimate of current emissions.

In November 2007, the CAO purchased 30,000 *metric* tons of offsets through CCX, which is more than the 24,000 *short* tons identified in the Green the Capitol Initiative report and a memorandum approving the CAO's Chicago Climate Exchange application, which was signed by the Committee on House Administration in August 2007.⁶ The CAO purchased approximately 9,075 short tons (about 8,231 metric tons), more than identified in the Green the Capitol Initiative, an amount valued at about \$24,447 based on the weighted average purchase price of \$2.97 per metric ton paid by the CAO.⁷ According to the House CAO and CCX, the purchase of additional tons was an administrative error that resulted from the difference between short and metric tons and reference to the draft report rather than the final report.⁸ An April 2007 draft of the Green the Capitol Initiative report identified the need to purchase 34,000 tons, but the June 2007 final report identified the need to purchase 24,000 short tons. On March 27, 2008, the CAO requested that CCX retire 24,000 of the 30,000 *metric* tons.⁹ Currently, 6,000 metric tons remain in the CAO's registry account, which, according to the CAO, may be used to offset additional emissions generated by the operation of the House. The CAO said that the initial purchase of carbon offsets was an approximation and plans to reconcile the purchase in fiscal year 2009.

Because it retired 24,000 metric tons instead of short tons, the CAO retired about 2,460 short tons (about 2,231 metric tons) more than identified in the Green the Capitol Initiative report. These extra tons are valued at about \$6,626 based on the CAO's purchase price. According to the CAO, the retirement of extra tons may address uncertainties in the emissions calculations used to determine the amount of offsets to purchase.

⁶A metric ton is equivalent to 2,205 pounds and a short ton equals 2,000 pounds.

⁷The price per metric ton of carbon traded on CCX has increased since the CAO purchase. For example, in June 2008, the market closing price of CFIs reached \$7.40 per metric ton.

⁸The CAO and CCX said that the cost of 30,000 metric tons purchased in November was below the cost projected for 24,000 metric tons and also below the cost estimated for the purchase of 24,000 metric tons at the time of passage of the relevant appropriations bill.

⁹The term "retirement" refers to the permanent recorded disposition of an offset after which it cannot be resold or otherwise utilized by any entity to facilitate, enable, or offset any past, present, or future greenhouse gas emission.

Following the auction, the CAO received information from CCX about the number and types of projects underlying its purchase. No other information was provided by CCX or requested by the CAO. The offsets purchased by the CAO came from a variety of project types, including agricultural methane, agricultural soil sequestration, coal mine methane, landfill methane, and renewable energy. The CCX auction notice required that offsets submitted to the auction originate from U.S.-based projects, and CCX officials said that they screened the registry accounts of auction participants to confirm that the sellers' offsets were from U.S.-based projects. Registry accounts maintained by CCX for market participants track the type of information necessary to satisfy the criteria directed by the appropriations committee report. Thus, the CAO could verify that the offsets met the criteria, if necessary. The CAO can also request that CCX provide additional quality assurance documentation, including detailed verification reports.

Appendix V: Summary of Stakeholder Responses to Interview Questions

Table 3: Stakeholders' Rating of Carbon Offset Market Challenges

How challenging, if at all, are each of the following for the effective functioning of the U.S. voluntary carbon offset market?	(0) Not at all challenging	(1) Slightly challenging	(2) Moderately challenging	(3) Very challenging	(4) Extremely challenging	Don't know/ unsure	Total responses ^a	Average ^b
Additionality	0	8	5	13	7	0	33	2.58
Many different verification and monitoring methodologies	0	4	13	9	7	0	33	2.58
Press coverage of offsets	2	4	10	8	8	1	33	2.50
Education	1	3	15	11	3	0	33	2.36
Permanence	1	8	11	11	2	0	33	2.15
Baseline quantification methodologies	0	4	22	7	0	0	33	2.09
Transaction costs associated with quantification, verification, and monitoring	0	9	13	8	2	1	33	2.09
Leakage	1	9	16	4	3	0	33	1.97
Reduction quantification methodologies	0	6	23	4	0	0	33	1.94
Liability	0	12	13	2	3	3	33	1.87
Timing of reductions (future, past)	5	10	11	5	1	1	33	1.59
Establishment of ownership	0	18	9	3	1	2	33	1.58
Finding / matching buyers and sellers	7	9	12	3	0	1	32	1.35
Many different types of projects	8	15	5	4	1	0	33	1.24

Source: GAO.

^aThe total column represents the number of stakeholders that answered each question with a single answer.

^bThe average column represents the average of the numerical ratings submitted by stakeholders for (0) Not at all challenging through (4) Extremely challenging. The average does not include responses for Don't know/ unsure, because this is not a numerical rating.

**Appendix V: Summary of Stakeholder
Responses to Interview Questions**

Table 4: Stakeholders' Rating of Characteristics of Offset Credibility

How important, if at all, are each of the following for establishing the credibility of a carbon offset?	(0) Not at all important	(1) Slightly important	(2) Moderately important	(3) Very important	(4) Extremely important	Don't know/ unsure	Total responses^a	Average^b
Additionality	1	1	2	3	26	0	33	3.58
Transparency	0	0	0	14	19	0	33	3.58
Permanence	0	1	2	8	22	0	33	3.55
Verification and monitoring	0	0	3	9	21	0	33	3.55
Use of registry to avoid double- counting	0	0	4	12	16	1	33	3.38
Established ownership	0	2	6	10	15	0	33	3.15
Clear institutional arrangement	1	2	7	7	10	5	32	2.85
Reputation of offset provider	1	3	11	9	9	0	33	2.67

Source: GAO.

^aThe total column represents the number of stakeholders that answered each question with a single answer.

^bThe average column represents the average of the numerical ratings submitted by stakeholders for (0) Not at all important through (4) Extremely important. The average does not include responses for Don't know/ unsure, because this is not a numerical rating.

**Appendix V: Summary of Stakeholder
Responses to Interview Questions**

Table 5: Stakeholders' Rating of the Credibility of Different Types of Carbon Offset Projects

How credible, if at all, is each type of project?	(0) Not at all credible	(1) Slightly credible	(2) Moderately credible	(3) Very credible	(4) Extremely credible	Varies	Don't know/ unsure	Total responses ^a	Average ^b
Agriculture methane	0	1	1	8	12	9	0	31	3.41
Fuel switch	0	0	3	5	10	12	1	31	3.39
Landfill methane	0	1	3	6	10	10	1	31	3.25
Coal mine methane	0	4	2	4	7	10	4	31	2.82
Industrial gas	1	0	7	2	7	11	2	30	2.82
Non-REC renewable energy	1	2	3	8	4	11	1	30	2.67
Energy efficiency	2	2	5	6	6	10	0	31	2.57
Afforestation	2	1	4	5	4	14	1	31	2.5
Reforestation	2	2	5	3	6	13	0	31	2.5
Avoided deforestation	1	4	5	2	4	14	1	31	2.25
Agriculture soil carbon	0	10	5	5	1	9	1	31	1.86
Rangeland soil carbon	1	8	7	4	1	9	1	31	1.81
Renewable energy certificates (REC)	9	3	2	3	2	12	0	31	1.26

Source: GAO.

Notes: The answers provided by stakeholders represent their ratings at a particular point in time and may not reflect the development of new mechanisms to ensure the credibility of offsets. Several stakeholders commented that any project, properly constructed, can generate acceptable offsets. They said that there are issues that make some project types easier to develop than others, but that does not mean that acceptable quantification methodologies cannot or will not be developed.

^aThe total column represents the number of stakeholders that answered each question with a single answer.

^bThe average column represents the average of the numerical ratings submitted by stakeholders for (0) Not at all credible through (4) Extremely credible. The average does not include responses for Varies and Don't know/ unsure because these are not numerical ratings.

Appendix VI: Summaries of Selected International, Regional, and State Programs

California Global Warming Solutions Act (Assembly Bill [AB] 32)	On September 27, 2006, the California Global Warming Solutions Act was signed into law. The act requires the California Air Resources Board (ARB) to establish a program to reduce the state's emissions to 1990 levels by 2020. On June 26, 2008, ARB released a draft scoping plan for public comment that contains the strategies California will use to reduce emissions of greenhouse gases. The draft includes a discussion of the potential role of offsets in implementing AB 32. Specific commitments on the role of offsets in AB 32 will be available in a revised scoping plan that ARB will publish in early October 2008 for comment. This version of the plan will be presented to the Air Resources Board in November 2008 for possible adoption by the board. AB 32 requires the board to adopt a scoping plan by January 1, 2009. Regulations based on the final scoping plan must be adopted by January 1, 2011, and are to become effective on January 1, 2012. More information about implementation of the California Global Warming Solutions Act is available at http://www.arb.ca.gov/cc/cc.htm .
European Union Emissions Trading Scheme (EU ETS)	The European Union Emission Trading Scheme is a cap-and-trade system in which energy-intensive industries in the European Union buy or sell emission allowances to help meet member states' commitments under the Kyoto Protocol. The EU ETS covers over 11,000 electricity-generating facilities and energy-intensive installations, such as oil refineries and steel plants, in 27 member countries. The EU ETS enables regulated entities to use certain types of offsets for compliance. In some cases, regulated entities may choose to comply with emissions limits by purchasing offsets rather than by reducing their own emissions. Limits for the use of offsets vary by country, with a range from zero to 20 percent of a country's total cap, and an average limit of 11 percent. These limits apply to the current Phase II of the EU ETS and may change in Phase III, which begins in 2013. For more information about the EU ETS, see http://ec.europa.eu/environment/climat/emission.htm
Midwestern Greenhouse Gas Reduction Accord	The governors of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Ohio, South Dakota, and Wisconsin, and the premiers of the Canadian provinces of Manitoba and Ontario participate or observe in the Midwestern Greenhouse Gas Reduction Accord, an agreement to establish greenhouse gas reduction targets and time frames, and to develop market-based mechanisms to reach these targets. The accord was established in November 2007. An offsets subgroup is expected to make recommendations about the role of offsets in a regional emissions reduction program by September 2008, according to the subgroup's work plan. More information about the Midwestern Greenhouse Gas Reduction Accord is available at http://www.midwesternaccord.org/ .
Regional Greenhouse Gas Initiative (RGGI)	The Regional Greenhouse Gas Initiative is a cooperative effort by Northeast and Mid-Atlantic states to design a regional cap-and-trade program initially covering carbon dioxide emissions from power plants in the region. Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont are participating in the RGGI effort. The District of Columbia, Pennsylvania, Ontario, Quebec, the Eastern Canadian Provinces, and New Brunswick are observers in the process. On August 15, 2006, the participating states issued a model rule that details the proposed RGGI program. Offset projects included in the program are initially limited to five types of projects, including landfill methane capture and sequestration, because these types occur within the borders of the RGGI states, among other factors. The model rule specifies offset project requirements including criteria for additionality, quantification and verification of emissions reductions, independent verification, and accreditation standards for independent verifiers. Each source required to reduce emissions would generally be able to use offsets to comply with up to 3.3 percent of its obligation in a single compliance period. If the compliance price hits certain levels, the use of offsets may increase to 5 or 10 percent of required reductions. The first 3-year compliance period will begin January 1, 2009. More information about RGGI is available at http://www.rggi.org/index.htm .

**Appendix VI: Summaries of Selected
International, Regional, and State Programs**

United Kingdom Department for
Environment, Food and Rural Affairs
(DEFRA)

On February 19, 2008, the United Kingdom (UK) Department for Environment, Food and Rural Affairs announced the framework for the Code of Best Practice for Carbon Offsetting to provide UK consumers with guidance on carbon offsets. The code is designed to increase consumers' understanding of offsetting and its role in addressing climate change, increase consumer confidence in the integrity and value for money of the offset products available to them, and to provide signals to the UK offset sector on the quality and verification standards to which they should aspire. Offset products meeting the specifications of the code will be assigned with a certification mark, which providers may use on their Web sites and other materials. The code is voluntary and offset providers can choose whether to seek accreditation for all, or some, of their offsetting products. The code initially covers only Certified Emissions Reductions (CER), that are compliant with the Kyoto Protocol, because there is currently no definition or fully established common standard for voluntary offsets. DEFRA has asked the voluntary offset industry to jointly develop a standard that could be included in the code in the future. For more information about the DEFRA Code of Best Practice for Carbon Offsetting see <http://www.defra.gov.uk/environment/climatechange/uk/carbonoffset/index.htm>.

Western Climate Initiative (WCI)

The Western Climate Initiative was launched in February 2007 by the governors of Arizona, California, New Mexico, Oregon, and Washington to develop regional strategies to address climate change. Partners in the Initiative also include Montana, Utah, and the Canadian provinces of British Columbia, Ontario, Quebec, and Manitoba. Other U.S. and Mexican states have joined as observers. The WCI regional greenhouse gas emission reduction goal is an aggregate reduction of 15 percent below 2005 levels by 2020. On May 16, 2008, the WCI released recommendations about how to structure the region's cap-and-trade emissions reduction program, including a series of recommendations about how to incorporate offsets into such a program. A more detailed version of the draft offset recommendations was released in July 2008, and WCI is striving to reach a final agreement on overall program design in August 2008. More information about the WCI draft design recommendations on offsets is available at <http://www.westernclimateinitiative.org/>.

Source: GAO.

Appendix VII: Selected Carbon Offset Standards

Standard	Description
The California Climate Action Registry	The California Registry serves as a voluntary greenhouse gas (GHG) registry to protect and promote early actions to reduce GHG emissions. The California Registry develops reporting standards and tools for organizations to measure, monitor, third party verify, and reduce their GHG emissions consistently across industry sectors and geographical borders. For more information about the California Registry, see http://www.climateregistry.org/ .
The Carbon Neutral Protocol	The CarbonNeutral Protocol, a proprietary standard developed by The CarbonNeutral Company, describes the requirements for achieving “CarbonNeutral” status and the controls employed by The CarbonNeutral Company to ensure the correct use of CarbonNeutral logos. The protocol sets out the quality requirements for projects and schemes that produce offset credits that may be applied to make activities or entities CarbonNeutral under this program. For more information about the Carbon Neutral Protocol, see http://www.carbonneutral.com/pages/cnprotocol.asp .
Chicago Climate Exchange	CCX is a voluntary greenhouse gas reduction and trading system through which members make commitments to decrease their emissions. CCX participants may trade offsets generated from qualifying emissions reduction projects. CCX employs a central registry for recording emissions as well as holdings and transfers of its serialized emission units—Carbon Financial Instruments (CFI). The registry is linked with the CCX electronic trading platform. For more information about CCX, see http://www.chicagoclimatex.com/index.jsf .
Clean Development Mechanism	The Clean Development Mechanism (CDM) is part of the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC). CDM enables industrialized countries to achieve emissions reductions by paying developing countries for certified emission reduction credits. CDM projects must qualify through a registration and issuance process. The mechanism is overseen by the CDM Executive Board, answerable ultimately to the countries that have ratified the Kyoto Protocol. For more information about CDM, see http://cdm.unfccc.int/index.html .
Climate, Community, and Biodiversity Alliance	The Climate, Community, and Biodiversity Alliance (CCBA) is a partnership among companies, nongovernmental organizations, and research institutes seeking to promote integrated solutions to land management around the world. CCB standards are project design standards for evaluating land-based carbon mitigation projects in the early stages of development. For more information about the CCB standards, see http://www.climate-standards.org/ .
Climate Leaders	Climate Leaders is an EPA industry-government partnership that works with companies to develop climate change strategies. EPA Climate Leaders, a voluntary emissions reduction program, provides technical assistance to companies on how to calculate and track greenhouse gas emissions over time, calculate emissions reductions from offsets, and incorporate offsets into emission reduction strategies. EPA has developed accounting methodologies for certain offset project types including landfill gas, manure management, afforestation, transportation, and boiler replacement projects. Project protocols are being developed for additional project types, including coal-bed methane, methane end use from landfill and manure management projects, and forest management. For more information about Climate Leaders offset methodologies, see http://www.epa.gov/climateleaders/resources/optional-module.html .

Appendix VII: Selected Carbon Offset Standards

Standard	Description
Climate Neutral Network	The Climate Neutral Network is an alliance of companies and organizations committed to developing products, services, and enterprises that have a net-zero impact on global warming. The Climate Neutral Network certifies companies whose products, services, and/or enterprises have a net-zero impact on global warming. The Climate Neutral Network is closing as a nonprofit and transferring its certification program to another nonprofit. For more information about the Climate Neutral Network, see http://climatenetwork.org/ .
Gold Standard Voluntary Emissions Reduction (VER)	The Gold Standard offers a quality label to voluntary offset projects for renewable energy and energy efficiency projects with sustainable development benefits for the local community. Gold Standard projects are tested for environmental quality by third parties and the Gold Standard carbon credit label is granted after third party validation and verification of the offset project. For more information about the Gold Standard VER, see http://www.cdmgoldstandard.org/index.php .
United Kingdom Department for Environment, Food and Rural Affairs Code of Best Practice for Carbon Offsetting	On February 19, 2008, the United Kingdom Department for Environment, Food and Rural Affairs (DEFRA) announced the framework for the Code of Best Practice for Carbon Offsetting to provide consumers with guidance on carbon offsets. Offset products meeting the requirements of the code will be assigned a certification mark that providers may use on their Web sites and other materials. The code is voluntary, and offset providers can choose whether to seek accreditation for all, or some, of their offsetting products. For more information about the DEFRA Code of Best Practice for Carbon Offsetting see http://www.defra.gov.uk/environment/climatechange/uk/carbonoffset/index.htm .
Green-e Climate	Green-e Climate is a certification program for carbon offsets sold to consumers on the retail market. Green-e Climate sets consumer protection and environmental integrity standards and employs a three-step verification and certification service that ensures supply equals sales, offsets are independently certified, and consumer disclosures are accurate and follow program guidelines. For more information about Green-e Climate, see http://www.green-e.org/getcert_ghg.shtml .
Greenhouse Friendly™	Greenhouse Friendly is an Australian government initiative aimed at providing businesses and consumers with the opportunity to sell and purchase greenhouse neutral products and services. For more information about Greenhouse Friendly, see http://www.greenhouse.gov.au/greenhousefriendly/index.html .
ISO 14064	ISO 14064 is a three-part international standard that provides guidance on developing organization-level emissions inventories; quantifying, monitoring, and reporting greenhouse gas emissions reductions at the project level; and validating and verifying greenhouse gas emissions reduction projects. More information about ISO 14064 standards is available at http://www.iso.org/iso/home.htm .
Plan Vivo	Plan Vivo is a system for managing the supply of verifiable emission reductions from rural communities in a way that promotes sustainable livelihoods. Companies, individuals, or institutions wishing to offset greenhouse gas emissions can purchase voluntary emission reductions via a project trust fund in the form of Plan Vivo Certificates. Projects use the Plan Vivo management system to register and monitor carbon sequestration activities implemented by farmers. For more information about Plan Vivo, see http://www.planvivo.org/ .
Social Carbon	Social Carbon has the objective of guaranteeing that the projects developed for the reduction of greenhouse gas emissions significantly contribute to sustainable development, incorporating transparent methods of access and measurement of the benefits that are returned to the parties involved and to the environment. The aim of the Social Carbon methodology is to provide offsets that also provide clear social and environmental benefits in the areas where projects operate. For more information about the Social Carbon methodology, see http://www.socialcarbon.com/ .

Appendix VII: Selected Carbon Offset Standards

Standard	Description
VER+	The VER+ Standard provides a global standard for voluntary greenhouse gas emission reduction projects. The criteria of the VER+ Standard are streamlined with those of CDM, including the requirements of project additionality and corresponding tests that prove the project is not a business-as-usual scenario. For more information about the VER+ standard, see https://www.netinform.de/KE/Beratung/Service_Ver.aspx .
Voluntary Carbon Standard	The Voluntary Carbon Standard (VCS) was initiated by The Climate Group, the International Emissions Trading Association, and the World Economic Forum in late 2005 to standardize and provide transparency and credibility to the voluntary offset market, among other objectives. To recognize credible work that has gone into developing greenhouse gas programs around the world, the VCS Program has a process for recognizing programs that meet VCS criteria. For more information about the VCS, see http://www.v-c-s.org/index.html .
Voluntary Offset Standard	The International Carbon Investors and Services (INCIS) Voluntary Offset Standard (VOS) can be used as a minimum standard when purchasing verified emission reduction credits on behalf of organizations or individuals offsetting their greenhouse gas emissions. The Voluntary Offset Standard is intended to support the development of emerging carbon markets around the world, and support international policy convergence with a view to long-term carbon market integration. For more information about the VOS, see http://www.carboninvestors.org/documents .
Greenhouse Gas Protocol	The Greenhouse Gas Protocol, a partnership between the World Resources Institute and the World Business Council for Sustainable Development, provides an accounting framework for greenhouse gas standards, programs, and inventories around the world. For more information about the Greenhouse Gas Protocol, see http://www.ghgprotocol.org/ .

Source: GAO analysis of offset standards cited by stakeholders and available market studies.

Notes: Registries for tracking the distribution of offsets are not included in this table. Certain standards require the use of specific registries.

This table summarizes and introduces the variety of standards available in the voluntary offset market. It is not an exhaustive list of standards, nor is it intended to provide precise descriptions.

We do not summarize or compare the criteria of these standards because they exist for different purposes and apply to different portions of the carbon offset supply chain. For more specific information, please see standard documentation available at the referenced Web sites, if available.

Appendix VIII: GAO Contact and Staff Acknowledgments

GAO Contact

John B. Stephenson, (202) 512-3841 or stephensonj@gao.gov

Staff Acknowledgments

In addition to the contact named above, Michael Hix, Assistant Director; Janice Ceperich; Nancy Crothers; Cindy Gilbert; Richard Johnson; Ben Shouse; Ardith A. Spence; and Joseph Thompson made major contributions to this report. Richard Burkard, Terrell G. Dorn, Steve Gaty, Jim McDermott, Andy O'Connell, Dan Packa, Kate Robertson, Ray Rodriguez, Jena Sinkfield, and Sara Vermillion also made important contributions.

GAO's Mission

The Government Accountability Office, the audit, evaluation, and investigative arm of Congress, exists to support Congress in meeting its constitutional responsibilities and to help improve the performance and accountability of the federal government for the American people. GAO examines the use of public funds; evaluates federal programs and policies; and provides analyses, recommendations, and other assistance to help Congress make informed oversight, policy, and funding decisions. GAO's commitment to good government is reflected in its core values of accountability, integrity, and reliability.

Obtaining Copies of GAO Reports and Testimony

The fastest and easiest way to obtain copies of GAO documents at no cost is through GAO's Web site (www.gao.gov). Each weekday, GAO posts newly released reports, testimony, and correspondence on its Web site. To have GAO e-mail you a list of newly posted products every afternoon, go to www.gao.gov and select "E-mail Updates."

Order by Mail or Phone

The first copy of each printed report is free. Additional copies are \$2 each. A check or money order should be made out to the Superintendent of Documents. GAO also accepts VISA and Mastercard. Orders for 100 or more copies mailed to a single address are discounted 25 percent. Orders should be sent to:

U.S. Government Accountability Office
441 G Street NW, Room LM
Washington, DC 20548

To order by Phone: Voice: (202) 512-6000
TDD: (202) 512-2537
Fax: (202) 512-6061

To Report Fraud, Waste, and Abuse in Federal Programs

Contact:

Web site: www.gao.gov/fraudnet/fraudnet.htm

E-mail: fraudnet@gao.gov

Automated answering system: (800) 424-5454 or (202) 512-7470

Congressional Relations

Ralph Dawn, Managing Director, dawnr@gao.gov, (202) 512-4400
U.S. Government Accountability Office, 441 G Street NW, Room 7125
Washington, DC 20548

Public Affairs

Chuck Young, Managing Director, youngc1@gao.gov, (202) 512-4800
U.S. Government Accountability Office, 441 G Street NW, Room 7149
Washington, DC 20548