BUSINESS DECISIONS AROUND CARBON OFFSETS:
EXAMINING THE DRIVERS OF VALUE AND SOURCES OF UNCERTAINTY

by Suzanne Greene, Jimmy Adames, Ana Lucia Alonzo, and Dai Forterre

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SECTION 1: UNDERSTANDING THE ISSUE
Why Worry About Carbon Offsets? Why Now?

From popular science to global legislation, very little is certain when it comes to climate change. Anthropogenic carbon emissions have more than tripled over the last 50 years. While this is a source of alarm for many, but general popular opinion about the implications remains mixed, particularly in the United States. Nevertheless, many world governments have or are considering policies to curtail carbon emissions. Even in places like the United States, where the adoption of a national policy addressing carbon emissions does not appear imminent, the market’s perspective on climate change has shifted. As a result, many firms, especially those with a foothold in the global marketplace, are finding themselves taking a serious look at their carbon emissions, often with marked trepidation.

A firm may have a range of motivations for considering a reduction of its carbon output. As carbon footprint labels take shape in places like France and Japan, the general public will begin to gain a better understanding about the environmental impact of companies and products, incentivizing efficiency in the manufacturing process. Firms must also consider the shifting landscape of international government regulations, most notably the upcoming end to the first commitment period of the United Nations Framework Convention on Climate Change Kyoto Protocol in 2012, the close of the 3rd Trading Period of the European Union Emissions Trading Scheme (EU ETS) in 2013, and the enactment of an Australian carbon tax as a precursor to a national carbon market. This state of flux has inspired preemptive action by some firms and a “wait and see” position in others. Decision-making criteria are further complicated by the lack of globally adopted emissions accounting methodologies, an increased number of outlets to declare carbon emissions, uncertainty about the degree of accountability expected by customers, and the perceived risks or benefits to brand equity.

Given these complex marketplace dynamics, every firm needs to understand the opportunities and risks posed by setting reduction targets on carbon emissions within its supply chain. Carbon offsets represent a key consideration in the decision-making process. At a superficial level, offsets seem relatively straightforward. One entity has a technological, ecological, or operational alternative that would reduce its carbon emissions. Another entity would like to reduce its associated emissions and so purchases a carbon offset credit from the first company to fund the project to avoid or reduce emissions. However, when offsets are implemented, the issues around realization and valuation of offsets are often complex and fraught with significant uncertainty.
At the outset of awareness around carbon emissions, many firms rushed into purchasing offsets as a way to address regulatory or brand awareness pressures, only to face a backlash from those who believed that a firm should first lessen its impact internally before considering the purchase of offsets. Alternately, those who were able to reduce their emissions may have found themselves suddenly able to sell carbon offsets, creating an environment where reducing emissions in one place only to sell offsets for output elsewhere doesn’t necessarily work toward reaching sustainability targets. Although at first glance, carbon offsets appeared to be an obvious asset in a firm’s environmental stewardship portfolio, in reality, the benefits of the practice have proved to be far from clear.

This white paper was developed by the Massachusetts Institute of Technology Global Leaders in Environmental Assessment and Performance to help address key questions that business decision-makers face in the area of carbon offsets. Specifically:

1. What is an offset? Or, more important, how does a firm create value from an offset?
2. What are the key challenges (or sources of uncertainty) to consider in assessing the value of an offset?

This report aims to discuss the multiple dimensions surrounding these questions and contribute tangible case studies to further inform the discussion.

SECTION 2: HOW DO YOU CREATE VALUE FROM THIS ACTIVITY?
An Overview of Carbon Offsets

WHAT MAKES A CARBON OFFSET MARKET?
Intangible carbon offsets are made “real” through a market program. Many such market programs exist and each generally shares the same basic characteristics. First, a market must have accounting rules that define the amount of greenhouse gas that is represented by an offset credit. Second, there must be a clear plan by which offsets are monitored, verified, and certified; that is, there must be proof that the offset is truly reducing the amount of emissions as purported. Finally, the market must have a registration system by which offsets can be tracked, thus ensuring an offset is not double counted. There are two major market mechanisms, compliance markets (also known as regulatory or mandatory markets) and voluntary markets, both of which are described in brief below.

Compliance Markets
In a compliance marketplace, the emissions of a country or industry are capped at a level informed by historic emissions, known as a base year, and penalties are assessed for non-compliance. Those with emissions volumes that cannot feasibly be reduced seek those with certified emissions reductions (carbon...
offset credits), and vice versa. Compliance markets are the primary driver of the offset marketplace, with more than 10 times the trading volume of the voluntary marketplace.\textsuperscript{3} Two major compliance markets, the European Union Emissions Trading Scheme (EU ETS) and Kyoto Protocol, dominate the arena, while smaller regional markets, like the Alberta Greenhouse Gas Reduction Program and New South Wales Greenhouse Gas Reduction Scheme, make small, but growing, contributions.

Many compliance markets make use of flexibility mechanisms to enable industries to meet emissions reduction targets, most notably emissions trading schemes, clean development mechanisms (CDM), and joint implementation (JI) projects. CDM and JI projects generate a measured reduction in greenhouse gas (GHG) and include projects like industrial gas destruction, renewable energy conversion, or energy efficiency upgrades. The Kyoto Protocol, among others, allows carbon sinks like reforestation or conservation tillage projects as a qualifying emissions reduction practice; while others, like the EU ETS, do not accept these practices due to uncertainty issues that will be discussed in more detail below. In all compliance markets, third-party verification of offset credits and emission levels is required.

\textbf{Voluntary Markets}

Corporations, institutions, and individuals utilize voluntary markets to further an ethical mission, gain experience with the offset market, or, potentially, as a source of revenue.\textsuperscript{4} The standards around voluntary carbon offset credits vary by program; however, in general, most possess the following attributes: offset and emission verification is optional, there is little or no regulation of offset quality, and offset credits from a project cannot be traded in both voluntary and compliance markets. In 2010, a relatively small 131 metric tons of carbon were traded within voluntary markets, bringing the total value of the marketplace up to roughly $424 million.\textsuperscript{5} Major voluntary markets include the Gold Standard, Voluntary Carbon Standard, and Climate Action Reserve.

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<th>COMPLIANCE PROGRAMS</th>
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<td>Kyoto Protocol Offset Mechanisms (CDM/JI)</td>
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CARBON OFFSET QUANTIFICATION

While the methodologies may be quite different, the mechanisms of carbon offset credit quantification are generally the same in any market: baseline calculations, change modeling, and permanence. This section will provide an overview of offset quantification and will illuminate some of the uncertainties associated with each.

Baseline Emissions Calculation

A baseline level refers to a historic level of GHG emission or reduction against which an offset is being measured. The baseline calculation methodology for a given project is dependent on its economic sector and is generally chosen by the project developer. Under the Kyoto Protocol and EU ETS, project developers can either adopt one of the nearly 100 UNFCC-approved methodologies or submit their own for approval; however, the baseline calculation must fall into one of three categories:

1. Existing actual or historical emissions, or
2. Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment, or
3. The average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental, and technological circumstances, and whose performance is among the top 20% of their category.

Voluntary programs have a variety of different methodologies to calculate baseline scenarios, though many simply rely on United Nations (UN) guidance as the standard.

Even with the UN’s guidance and rulings, establishing baseline emissions levels remains controversial and confusing. For example, the year that is used to set the baseline level varies from country to country or program to program, thus muddying the perception of a level playing field. Carbon sink projects, such as conservation tillage, have come under fire for the uncertainty related to the calculation of pre-project carbon uptake levels, which can vary significantly by location, past land-use practices, and vegetation types.

Change Modeling

To maintain validity in all compliance markets and some voluntary markets, a carbon offset must be verifiable through measurement and monitoring. Depending on the type of offset project, modeling emissions reduction can be very straightforward. For example, with industrial gas destruction, the presence of the equipment can easily be observed and the volume of gas eliminated can be measured by metering equipment. Other projects are less straightforward; for example, in the case of the replacement of fossil fuel energy with renewable...
energy sources such as wind, while the quantity of wind energy generated may be apparent, the avoided emissions within the energy grid are often difficult or impossible to verify.

**Permanence**
In order for an emissions reduction project to be registered in a marketplace, the project must be maintained for the lifetime of the carbon offset credit, which can range from a permanent reduction or one that expires after a set time limit. The requirements for proving the permanence of an offset depend on the type of project and the targeted marketplace. While a buyer may be concerned about the permanence of a purchased offset, it is the responsibility of the seller to maintain their offsets in concert with their chosen market’s standards.

**CARBON OFFSET QUALIFICATION**
For offset sellers, determining how to shape a carbon offset project largely depends on the type of market in which the credits will be entered. Below is a brief overview of some of the most critical qualifications to consider while developing an offset project.

**Location**
While climate change is a global problem, the qualifying geographic location for offset projects varies by program and the majority of offset projects occur in a small subset of countries. Under the Kyoto Protocol and EU ETS, CDM projects must occur in a developing country, but the vast majority occur in China. For JI projects, the offset marketplace is centered primarily in Russia, with growing participation from Ukraine and other EU newcomers. In the voluntary marketplace, over half of all projects occur in the United States, with Latin America and Asia making up the bulk of the remainder.

**Industry Standards**
The methodology by which a GHG emission or reduction is calculated, monitored, and reported is known as a standard. A standard is not sufficient on its own and generally exists as a subset to an offset program, which registers and enforces the credit. A variety of standards exist that are unique to market programs, though many market-specific standards are built from existing platforms.

The two most widely accepted offset calculation standards are the World Business Council for Sustainable Development/World Resources Institute (WBCSD/WRI) GHG Protocol for Project Accounting and the International Organization for Standardization (ISO) standard 14064. The WBCSD/WRI GHG Protocol is focused solely on quantifying emissions reductions and does not measure any co-benefits like biodiversity or water quality. The protocol is employed by a variety of programs, industries, and governments as well as standards organizations, including the ISO 14064. The ISO 14064 standard,
which was developed for use in voluntary markets, provides a calculation protocol along with general requirements for co-benefits beyond GHG reduction. Most notably, ISO 14064 is used by the Voluntary Carbon Standard, Canadian GHG Offset Protocol, and the Climate Action Reserve.

**Additionality**
Additionality refers to the concept that, in order for credits from a carbon offset project to qualify for trade, the project must be above and beyond what a firm would have done under the usual circumstances. In other words, if a company wants to sell offsets, it must prove that the project was completed solely to reduce GHG emissions and would not have occurred otherwise. The Kyoto Protocol and EU ETS developed a tool that analyzes a project’s additionality based on four criteria: the identification of credible alternatives, an analysis of the profitability of the proposed project (it shouldn’t be more profitable than an alternative), a common practice analysis, and a barrier analysis to cover any remaining issues. Even with this guidance, additionality continues to be one of the more difficult aspects to prove regarding carbon offsets, an issue that will be discussed in greater depth below.

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**CURRENT STATE OF MARKET VALUATION**
Uncertainty in global emissions policies has constrained consistent growth within the offset marketplace. With the impending expiration of the first commitment period of the Kyoto Protocol, global carbon markets are trending sharply downward. CDM trading volumes peaked in 2007, with uncertainty regarding CDM renewal discouraging new participation. The US Regional Greenhouse Gas Initiative (RGGI) flourished in 2009, expanding by a factor of 10 to $2.2 billion USD under the anticipation of a federal mandate; however, conflict within Congress leaves the future of carbon regulation highly uncertain. Further, New Jersey has withdrawn from RGGI (with several other states also considering withdrawal), undermining the market’s credibility and potential for effectiveness, at least in the short term. Voluntary markets suffered a major setback in 2010 with the collapse of the Chicago Climate Exchange, the only legally binding emissions trading scheme in the United States. However, the remaining voluntary markets show a steady pace of growth, though the overall volume of trades is much lower than in compliance markets.

In July 2010, the Australian government adopted a carbon taxation plan that sets the stage for an emissions trading scheme expected to begin in 2015. Once enacted, the Australian marketplace promises to be a significant driver in the marketplace, with a potential volume as large as that of the EU ETS.
SECTION 3: WHAT ARE THE CHALLENGES?
Major Drivers of Value and Sources of Uncertainty
Around Offsets

Some elements of uncertainty within carbon offset markets are common to any market-based transaction. Others are unique (or at least uniquely intense), as in the case of an ephemeral good like an offset, which many times is an avoided output. Still a relatively new concept, the perception of the validity of carbon offsets by legislative bodies and the general public continues to shift over time. This uncertainty creates a risky environment for firms related to their position in the marketplace, with the potential for financial investments to fail or public relations to falter. The following section addresses some of these uncertainties and provides potential solutions to pitfalls that all market contenders face.

IMMATERIALITY

Many of the challenges associated with offset valuation and strategy derive from the fundamentally immaterial nature of offsets. Despite having a real financial value, a carbon offset is not a physical good. In fact, an offset represents the absence of a pollutant. This intangible nature means that offsets are inherently challenging to quantify and, therefore, to audit. Even a tangible project like afforestation, where a crop or forest is planted where there wasn’t one before, proves challenging. The accuracy of the carbon reduction capacity of vegetation is uncertain, and it’s often impossible to quantify the baseline carbon uptake level of the existing plot of land. Regardless of the project type, in the end, all of the stakeholders involved in offset transactions are confronted with the following questions: What is not being emitted? How do we know this change wouldn’t have happened anyway? For how long will this avoidance occur?

These questions and the inherent qualities from which they derive have engendered much of the concern and skepticism associated with offsets. Few who are familiar with the issue have not seen or heard discussions in the popular media that deride offsets as charade or fraud. The institutionalization of offset certification and trading has been built primarily to address these concerns and to overcome the inherent challenge of immateriality.

SOLUTION: As firms enter into the carbon market as either a buyer or a seller, it is vital to have staff who can remain current on the evolving issues surrounding the different types of carbon offsets. When considering offset project types that do not have globally accepted calculation standards, firms should consider bolstering internal expertise on trends in methodology development as well as participate in standards development committees to ensure that existing or developing projects remain viable.
PERMANENCE
One of the primary sources of uncertainty about the magnitude of most offset-related activities is the permanence or durability of emissions avoidance. For some projects, establishing permanence is simple. For example, in methane emissions reduction projects common at landfills, when methane is burned, it won’t be coming back. However, what if a landfill’s methane destruction equipment breaks down and a company is unable or unwilling to fix it? Permanence can also be undermined unintentionally, as with a reforestation project—there is no guarantee that a wildfire, invasive pest, or disease won’t destroy the project in one year or in 30 years. Many offset programs combat this by installing some form of failsafe to ensure that the carbon is truly being offset. For example, The Nature Conservancy’s voluntary offset program, certified by the Voluntary Carbon Standard, addresses this issue by setting aside significant additional reforestation areas to act as a reserve if an offset forest area is destroyed.12

In light of this uncertainty, a question always exists as to whether the action taken to avoid carbon emissions will continue to be in effect over the entire duration of the contracted period. Projects may be too numerous and remote to independently verify in a cost-effective way. Furthermore, measurement of the long-term, indirect effects of emissions reduction remains uncertain.

SOLUTION: A firm should look to align its choice of offset programs with its internal core competencies and environmental goals. Firms should be selective as to which offset programs to be a part of, such those with robust verification processes, ideally one where project monitoring continues on a set schedule for the life of the credit. Further, while purchasing offsets, firms should consider using offset programs that include a buffer to ensure the credit is generating adequate offsets throughout its lifetime. As an offset seller, a firm should build a buffer for any project with potential permanence issues.

ADDITIONALITY
Even with UN guidance, as offsets increasingly become a lucrative income source for developing countries, the difficulty in verifying that a project is happening solely for GHG reduction has created significant debate. The market suffered a significant controversy around HFC-23 destruction projects in China, which make up roughly 30% of the Kyoto marketplace.13 It came to light that the value of carbon offset credits created from the destruction of HFC-23 emitted in the refrigerant production process were worth nearly twice as much as the refrigerant itself. This created a perverse incentive for some Chinese manufacturers to increase refrigerant production simply to destroy excess HFC-23 to sell as lucrative offsets. In that case, the physical reduction of the harmful gas was easily quantifiable, but it didn’t reflect a reduction in emissions in the
spirit of the marketplace. In a different example, proving additionality for wind farms remains a significant challenge. With the growing market for wind as a renewable energy source, it is often impossible to prove for certain that a new wind farm constructed by funds from an offset trading program would not have been built through a more traditional funding source.

**SOLUTION:** Like most aspects of carbon markets, the guidelines around additionality are likely to evolve over the coming years. Firms should increase internal knowledge and experience with the trends in additionality legislation, specifically in relation to the offset types with which a firm is involved. Selecting projects that comply with UN-approved methodologies to assure additionality can help minimize risks for firms entering the marketplace.

**LEGISLATIVE DYNAMICS**

The way that governments value carbon offset credits varies over time through the passage or revocation of particular legislation, creating a confusing environment for those considering entering the offset market. A significant challenge derives from the global nature of contemporary supply chains that cut across state and national boundaries.

Timelines on environmental legislation evolve, and countries make differing commitments to carbon reductions. Elections can change the dominant political landscape, which makes particular legislation more or less likely depending on the results. The economic challenges of the past several years have forced governments to place global warming mitigation on the back burner thereby changing the value of carbon offset markets. For example, when Barack Obama was first elected to the US presidency in 2008, policy on climate change was viewed as imminent; now, given the subdued economy and shift in the political majority, this seems much less likely. Similarly, the United Kingdom had invested significant resources in carbon mitigation activities, but given the recent global financial challenges, this too has waned in recent years. In the realm of international regulation, the Copenhagen sessions provide a roadmap of sorts for how legislation might move and where investments might be made. For one, the UN committed significant capital to the funding of reforestation through the Reducing Emissions from Deforestation and Forest Degradation (REDD) program after the December 2009 Copenhagen accord ($4 billion USD), seeding the possibility for private firm matching investments. The most recent UN sessions in Cancun produced an agreement that calls on developed countries to commit to reducing emissions and assisting poor countries with emissions reductions and climate change adaption through a Green Climate Fund, but the agreement fell short of any real commitments or commitments to or timelines for reaching either goal.
As countries become part of or are removed from particular international legislative bodies, there are further dynamics to the offset markets. For example, Taiwan, which is not part of the UN and therefore does not have direct engagement with the CDM, has engaged with the carbon market through alternative mechanisms. At a more micro-level, particular policies may impact the methods of calculating offsets such as indirect land land-use change issues in biofuels. This creates uncertainty for the value of the offsets themselves given the need to calculate baselines, additionality, and total carbon offset potential. All of these legislative uncertainties mean that the mechanisms for commercializing the value of offsets are evolving.

**SOLUTION:** Companies have dealt with these uncertainties in a variety of ways, including the monitoring of and involvement in the development of legislation that most impacts the markets with which they are involved. This serves two purposes. First, the companies remain abreast of the evolution of the field and maintain maximum flexibility as solutions develop. Second, having “a seat at the table” enables firms to influence the way legislation is written and managed. Because the division of a company that is engaged in government relations may not be the same division that addresses environmental issues, communication on company strategy around offsets should occur across all relevant divisions of the firm.

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**AUSTRALIAN CARBON TAX TO SPAWN MAJOR MARKETPLACE**

Australia’s recent decision to tax major GHG emitters has sparked polarizing debates on the perpetually divisive issue of carbon taxation both within the country and around the globe. According to the Australian government, the plan will levy a fee of $25 USD per metric ton on firms that produce over 25,000 tons of carbon dioxide per year, with the exception of agriculture, forestry, and private motorists. For a country that currently depends on coal for 80% of its energy, Australia’s mining industry is expected to take a hit as companies look to renewable energy sources as a way to drive down costs. Further, the carbon tax is expected to cause an increase in food and energy prices, which the government intends to offset using the proceeds of the carbon tax.

The carbon tax will rise each year until 2015, at which time a cap on emissions will be implemented, allowing an emissions trading platform to establish the market value for carbon. The proposed marketplace will include the use of carbon offsets, with a provision allowing Kyoto-compliant credits to be traded domestically or abroad and non-Kyoto credits to be traded solely on the domestic voluntary market. Australian offset project types will include reforestation, forest protection, conservation tillage, and methane gas destruction.
SCIENTIFIC AND TECHNOLOGY DYNAMICS

Both the understanding of the specific urgencies around global climate change based on emerging climate science and the technologies available related to offsetting these potential changes are evolving rapidly. While a firm may not have direct access to information on both of these issues, the ongoing changes may impact the way their offset projects are valued or may create change within the portfolio of options available to the firm. In terms of climate science, data continues to be collected on the degree of temperature rise based on atmospheric levels of carbon dioxide and other greenhouse gases, and this contributes to uncertainty in the value of offsets. Furthermore, as new and conflicting information emerges on sea-level rise, the impact of ocean acidification, and permafrost melt, further uncertainty arises from the changing and often increasing levels of urgency. From a technology perspective, decisions by firms on when or how to begin projects may be complicated by the development of the best available technologies. The technologies for carbon sequestration efforts are one example of this dynamic.

Carbon sequestration projects generally fall into two categories: technologies that improve carbon dioxide capture and storage at an emission source, and those that enhance natural carbon sequestration processes. With roughly one-third of US emissions coming from power plants or other point sources, improving mechanical carbon sequestration is one potential solution for meeting emissions reduction goals. Technologies that inject carbon dioxide into geologic features, such as oil fields, coal seams, or the deep ocean, have been increasing in efficacy and thus are receiving greater acceptance. This has eased fears of untraceable, diffuse carbon leakage, or, more alarmingly, the possibility of a sudden (and potentially fatal) carbon leak. Advances in the understanding of natural sequestration are also gaining ground and show potential for the future. For example, studies have shown that vegetation that employs C4 carbon fixation, such as native flowering trees and bamboo, are significantly more effective in reducing atmospheric carbon dioxide, therefore reforestation and afforestation project managers could focus on planting primarily C4 species to increase the impact of their projects. Further, scientists are studying the possibility of bioengineering non-C4 food crops with this photosynthesis mechanism to increase global carbon sequestration through agricultural production.16

SOLUTION: There are a few ways to address the particular set of dynamics inherent to evolving climate science and emerging technologies associated with carbon markets. Larger firms may have the resources to staff their environmental teams with climate scientists and technology evaluation experts as part of their environmental teams. Smaller firms can rely on expert consultants, whose engagement may prove critical as these issues resolve. Collaboration
with experts provides a significant knowledge base to track and contribute information around uncertainty. Firms may also look to diversify the types of projects they undertake and consider projects that have an impact beyond simply the carbon offset value. For example, a reforestation project has the potential to preserve biodiversity and improve a local economy along with a carbon sequestration value; these multiple benefits may themselves serve to mitigate risk.

SECTION 4: HOW CAN COMPANIES ADAPT TO UNCERTAINTY?
Case Studies Illustrating Real Companies’ Market Experience

SUSTAINABLE DEVELOPMENT AND THE OFFSET MARKET:
CHIQUITA BRANDS INTERNATIONAL’S BIODIGESTOR
As part of their ongoing sustainability efforts, Chiquita Brands International recently constructed an innovative Biodigester system at their facility in Guapiles, Costa Rica. The facility produces banana, pineapple, mango, papaya, and passion fruit purées, juices, and frozen and dehydrated products, by-products of which are fruit peels and nutrient-rich wastewater, respectively. In a traditional system, the organic matter would decompose in holding cells, releasing into the environment methane gas, a harmful greenhouse gas with more than 20 times the global warming potential of carbon dioxide.

At the Guapiles facility, wastewater flows from the manufacturing facility through a screen to catch large particles, which are then used as compost by local farmers. The remaining wastewater runs through an anaerobic digestion system where bacteria breaks down the nutrients, releasing methane in the process, which is captured and burned in order to produce energy. The remaining water then flows to lagoons where it undergoes a final aerobic digestion in order to meet allowable standards for discharge into the local waterway.
The Biodigester system is currently in the first phase of operation, and produces 600–650 cubic meters per day of biogas with an average methane content of 70%. At the Chiquita facility, management has been using the biogas as cooking fuel in the cafeteria and for drying clothes in the laundry facility. In February 2011, the plant began producing electricity from biogas through a generator. The plant created its first “banana kilowatt” and currently has the potential to power up to 31 houses per day. However, in order to expand the Biodigester to create more methane to provide energy for the plant as well as potentially the community as a whole, there will need to be a significant infrastructure investment. The potential for funding to the project through selling carbon offsets is there, and Chiquita is actively engaging several potential partners who could best help to navigate the project into and through the carbon market.

A Biodigester facility like this one may qualify for offsets in one of two ways: by the replacement of an existing carbon-based power source with a renewable source or simply through the destruction of methane through combustion. In terms of the renewable energy offset, Costa Rica is powered primarily by hydroelectricity, which is considered a renewable resource by most carbon market programs. In that case, the methane destruction alone may be enough to generate offsets, but, again, this is not so simple.

In order for the credits for methane destruction to qualify for most markets, Chiquita will have to prove additionality. Since this is a new plant that has always burned its methane, it may be difficult to prove that it is reducing its emissions—for this plant, it’s business as usual. On the other hand, this
is Chiquita’s first Biodigester plant; so as a corporation, it’s not business as usual – it’s an additional and voluntary effort. The plant will also have to prove its baseline level of emissions, which, again, may be low simply based on the innovative technology of this plant. Chiquita could potentially use the baseline level from a typical wastewater treatment plant for comparison, or could use the potential methane emissions if the wastewater is untreated as a suitable baseline. This will likely depend on the market program being selected. For this reason, Chiquita has integrated a much more expanded and comprehensive vision of the potential future capacity of the Biodigester in the design of the second phase of the project. Once the upgrade is complete, the plant has the potential to allow the generation of a larger amount of renewable biomass energy, enough for the plant to be self-sustainable and share this benefit with the community and other partners in the region.

There is a precedent for similar projects in Costa Rica – the Río Azul landfill has a UN-certified CDM methane combustion project that burns over 150,000 metric tons of carbon dioxide each year and could be used as a model. In addition, the UN has a standard methodology for certifying methane destruction (CDM Methodology AM0025) that would be accepted by many markets. The timing of the offset project is something to consider as well. Some markets, like the Climate Action Reserve, require the project start date to be no longer than a set timeline, six months in their case, prior to the registration of carbon credits in the marketplace. Considering the variability within each program, it will simplify the process to complete a review of viable carbon markets and then select the most appropriate offset program to proceed with measurements according to their standards.

**INTEGRATING SUSTAINABILITY INTO THE GLOBAL VALUE CHAIN: LESSONS FROM THE ASICS BUSINESS MODEL**

As companies transition to more sustainable practices, there is growing pressure from the marketplace to disclose and reduce the GHG emissions of products through voluntary and/or mandated channels. However, the thousands of brand-name companies that rely on foreign manufacturers to construct their products may find this challenging. The nature of an outsourced manufacturing system inherently creates a disconnect between a firm and its supplier; in fact, there is often a void of information about the materials and processes used based on product specifications by the brand company. ASICS, a Japanese sporting goods company with a worldwide customer base, is facing this issue head-on as they aim to mesh their commitment to sustainable products with the need to make sound business decisions, and, over time, real emissions reductions.

In order to set realistic and obtainable emissions reduction targets, it is essential to understand the GHG emissions of the manufacturing process. To that end,
ASICS and MIT completed a life-cycle analysis of their most popular running shoe, mapping emissions throughout each phase of production. The results illuminated emissions hotspots within the supply chain, both in terms of materials production and manufacturing processes. Armed with this information, ASICS designers are able to set clear reduction goals around a specific product, as well as look for ways to design future products more sustainably.

A logical place to begin targeting emissions reductions is to improve energy conservation in manufacturing processes. Yet, depending on how suppliers tackle the energy reduction pressure, brand names may find their GHG reductions are being traded in the carbon market. If a supplier is tasked with upgrading equipment or finding new processes in order to adapt to new environmental requirements, the project may be either cost-negative or cost-positive. When upgrades are economically feasible for the supplier, the brand-name company and the supplier will share the benefits of a reduced-cost production scheme. However, if upgrades are not economically feasible, the supplier could seek outside funding through the carbon marketplace to comply with the brand-name long-term environmental vision.

As soon as a supplier taps into a carbon offset through clean development mechanisms or private markets, the emission reductions are, technically, no longer the supplier’s to claim: the carbon offset buyer, as the provider of the financial resources, will be claiming the reductions. Since these carbon offsets are meant to be traded over long periods of time (e.g., 10 years), this creates a dilemma for brand owners. On the one hand, their commitment to environmental stewardship has created the right incentives for suppliers to effectively reduce their GHG emissions. On the other hand, since the supplier opted for a carbon offset project, the brand owner may not be able to claim the GHG reduction in its products. In fact, depending on the specific market the supplier chose to finance its reduction, emissions may not have been truly reduced from a global perspective; it has simply enabled a developed country to emit additional GHG.

For this reason, companies like ASICS are working more closely with suppliers to develop 21st century business goals that go beyond the development of a successful product to include the implementation of environmentally friendly practices that are quickly becoming the norm. This starts with an early understanding of the impacts of product design and aligning with suppliers operationally to identify cost-effective reduction projects to improve environmental hotspots. Once the potential improvements are identified, firms can engage in open discussions with suppliers on the financial implications of environmental mandates, with the end goal of developing a joint business case for the strategic investment in improvements—a process that is very much in line with the concepts of value streaming, Green Supply Chain Management,
As part of the analysis, the carbon offset funding option deserves consideration, though neither party will be able to absorb the full benefit of the GHG reduction during the lifetime of the offset credit.

**MANAGING THE CHALLENGE**

As the impact of and reaction to global warming continue to evolve, it is a significant challenge for firms to weigh the risks and benefits of using carbon offsets to fund environmental improvements. The shifting climate around global GHG policy continues to add to the uncertainty around the offset market, and long-term planning around emissions reduction has an element of risk. However, there is little doubt that climate change will continue to be an issue that many firms will need to address.

For the majority of firms, one of the most overwhelming aspects to consider before participating in an offset transaction is the variety of options for executing that transaction – multiple markets, standards, and technological options. Ultimately, this variety exists because of the novelty of the carbon markets. Over time, one would expect standardization to converge the global markets. As it does, transactions will become more straightforward. In the meantime, firms should put in the effort to consider the variety of options presented to them in today’s offset marketplace. Firms will benefit by keeping abreast of legislative trends in global and regional climate change policy, especially as the Kyoto Protocol and EU ETS systems are reworked in 2012.

To address the assurance issues associated with offsets, the best approach for any firm is to carefully follow established evaluation standards. Most firms lack the internal knowledge and skills to carry out such evaluations themselves and should engage knowledgeable experts to ensure that current information and practices are being applied to their offset decisions. In some cases, evaluation standards will not yet exist for a particular offset situation. Active participation in standards-setting bodies is the most effective way for any firm or industry to ensure that appropriate standards exist and that they capture pertinent issues to a particular technology or operational context.

When deciding how to best participate in the offset marketplace, it is worth considering the many co-benefits that an offset project may include, such as improvements to biodiversity, human health, or rural economies. Selecting projects with a suite of co-benefits identified as important to a firm and its customers can serve to further enhance sustainability and social responsibility agendas. Also, the location of the offset project should be considered. If, for example, a firm has a particular global warming impact in China, the firm could “act locally” to select offset projects that originate from that same area. While skepticism around carbon offsets in particular, and climate change in general, may continue to linger, the importance of such opinions will differ by
industry and firm. Many will benefit by creating an internal strategy to mitigate emissions, including the potential for accessing the carbon offset marketplace as either a buyer or a seller. Bolstering internal knowledge on trends in emissions regulation and related offset programs will help to reduce the risk to firms, and participation in standards development groups can help to ensure that a firm stays current during project development. In the end, the carbon market creates an opportunity for a firm to demonstrate its core sustainability principles, which has the potential to improve both a firm’s environmental impact as well as its consumer-facing reputation.

7. UNFCC. “Modalities and procedures for clean development mechanism, as defined by Article 12 of the Kyoto Protocol.” Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol. December 10, 2005, Montreal.
18. 21st-century business goals is a term coined at ASICS to indicate integrated environmental, social, and economic targets.
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The MIT Center for Transportation & Logistics has been a world leader in supply chain management research and education for more than three decades. Combining its cutting-edge research with industry relationships, CTL’s corporate outreach program turns innovative research into market-winning commercial applications. And in education, CTL is consistently ranked first among business programs in logistics and supply chain management. For more information, please visit http://ctl.mit.edu.

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The Materials Systems Laboratory (MSL) is a research group at MIT that studies the strategic implications of materials and materials processing choices. MSL works jointly with numerous corporate, government, academic, and industrial consortia as research partners. The resulting research seeks to understand the competitive position of materials in specific applications, such as assessment of different candidate materials, assessment of process technologies, and evaluation of both the economic and non-economic consequences of each alternative. The promise and limits of materials, processes, and designs are also evaluated, identifying specific areas of improvement for each alternative that will improve its competitiveness and determining the “best case” scenario for each option. For more information, please visit http://msl.mit.edu.

ABOUT LEAP
The Global Leaders in Environmental Assessment and Performance, developed by MIT’s Center for Transportation & Logistics and Materials Systems Laboratory, is a dynamic consortium of global companies created as a vehicle for organizations to leverage the vast knowledge and resources of MIT as well as the successes and failures of corporate environmental efforts around the world. LEAP offers an unprecedented opportunity for fact-driven and solution-oriented analyses of products and supply chains, giving companies the tools and information they need to measure their total environmental footprint, evaluate tradeoffs, and shape a sustainable action plan. To learn more about LEAP, contact Suzanne Greene (segreene@mit.edu).
ABOUT THE AUTHORS

JIMMY ADAMES
Mr. Adames is a Corporate Responsibility professional with 18 years of experience in the apparel industry. He works with ASICS counterparts located around the globe to strengthen and implement environmental and social strategies, engaging the international manufacturing facilities as well as internal stakeholders. Mr. Adames also leads initiatives and projects related to water usage and conservation, waste reduction/elimination, packaging, and recycling. Prior to joining ASICS America, he worked in distribution, manufacturing, plant engineering, product sourcing, and CR for several international apparel companies, including most recently VF Corporation.

ANA LUCIA ALONZO
Ms. Alonzo is currently the director of product supply planning for Chiquita Brands International. Since joining Chiquita in 2002 and having lived in Latin America, Europe, and North America, Ms. Alonzo has led numerous strategic initiatives that have evaluated network design, capacity, and asset management and optimal resource allocation across the banana, salad, and healthy snacking networks. Additionally, Ms. Alonzo has been very active in the support and development of sustainability and environmental performance activities at Chiquita, such as a joint initiative with MIT-CTL to measure the banana carbon footprint on a global basis as well as being the representative of Chiquita in the LEAP consortium.

DAI FORTERRE
Mr. Forterre is a CR and Sustainability professional with non-profit, governmental, and corporate experience. For a number of years, he has been responsible for the CSR program at ASICS Europe. In this role, his main focus is on upgrading processes and product design strategies by including environmental and ethical standards as key measures of quality and success. Mr. Forterre holds Master’s degrees in international relations and public law (University of Amsterdam, the Netherlands) and management (Durham University, UK). His main research question addresses the question of how modern globally operating companies can maintain and, where possible, strengthen their legitimacy in an ethically pluralistic world, while pursuing business innovation through applied sustainability thinking.

SUZANNE GREENE
Ms. Greene is the Environmental Footprinting Initiative Project Manager for the Massachusetts Institute of Technology. She works with the Materials Systems Laboratory and the Center for Transportation & Logistics to coordinate the Global Leaders in Environmental Assessment and Performance program as well as other sustainability-related research projects at MIT.