GreenBiz group

STATE OF GREEN BUSINESS 2012

by Joel Makower and the editors of GreenBiz.com

JANUARY 2012

GreenBiz Group

www.GreenBiz.com

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TOP SUSTAINABLE BUSINESS TRENDS OF 2012

Conventional wisdom says that sustainable business is in the dumps. Global markets are down for goods and services, companies and venture capitalists are tight-fisted in making clean and green investments, and the regulators have all but turned the henhouse over to the foxes. Cleantech has become a dirty word politically. Consumers are more preoccupied with saving their jobs and homes than with "saving the planet." Activists are pedaling hard to keep green issues in view, while the public's concern over climate change, at least in the United States, has pivoted from "dire" to "debatable."

Given this state of affairs, conventional wisdom says, the business world has moved on from environmental and sustainability concerns. After all, why be proactive when so little is being demanded of them?

Conventional wisdom is wrong.

Surprisingly—almost miraculously—environmental sustainability efforts continue to grow, relatively unabated, inside mainstream companies. As we've found throughout the global recession and recovery, companies continue to make, meet, and even exceed ambitious environmental goals related to their use of materials and resources, the emissions of their operations (as well as their suppliers'), the efficiency of their offices and factories, the ingredients of their products, and what happens to those products at the end of their useful lives. Beyond that, companies continue to innovate, buoyed by ongoing waves of new technologies and emerging business models that emphasize experience and access over ownership and consumption.

That's the good news.

The bad news is that despite companies' seemingly full-speed-ahead efforts, some environmental indicators are heading off course. In this year's GreenBiz Index (beginning on page 24)—our set of 20 indicators of how business is doing, environmentally speaking—six of them were downgraded. Using our swimming-treading-sinking rating system, they dropped from "swimming" to "treading," or from "treading" to "sinking." Many of these are economy related, and we expect to see improvements as the recovery continues. Nonetheless, these setbacks temper the otherwise positive trends.

Indeed, what setbacks we've seen in the worlds of sustainable business and clean technology have been relatively minor, amplified by those seeking to score political points or attract viewers or readers. For example, the failure of some high-profile solar companies is unfortunate, but it is part of natural technology cycles—in this case, the commoditization of solar cells to the point where countries with high labor costs can't compete, but also to the point where solar today is more affordable than ever.

Few recall that there were once dozens of personal computer manufacturers, some beloved—TRS-80, anyone?—that are now defunct, though one would be hard-pressed to make a case that PCs are a failed or inefficient technology. Low-cost manufacturing combined with continuous waves of innovation brought us the treasure trove of tech we enjoy today. And while reasonable minds debate the value of public subsidies for solar and other clean technologies, few recall that the development of transistors, the Internet, and GPS,

among other technologies we rely on dozens of times a day, all once received heavy government support.

And what about concern over climate change, considered by some the mother of all environmental issues? From a global policy perspective, it has all but vanished, the victim of political squabbling over the fate of the commons. But many of the world's largest companies are moving forward, some aggressively, to reduce or even eliminate their greenhouse gas emissions and those of their suppliers. Unfortunately, the overall trend on greenhouse gas emissions still isn't heading in the right direction.

Given the lack of mandates, why do companies bother to address climate? Because such emissions are a form of waste—a byproduct that has no value to the company or its customers, a proxy for inefficiency. And greenhouse gas emissions are increasingly seen as a risk factor, a liability to a company and its shareholders should public and political climate concerns rekindle. The price and availability of energy and water are also being scrutinized by investors to ensure companies won't be caught flatfooted if geopolitics, natural disasters, or other perturbations upend supplies. For companies, the risks and potential costs of doing nothing are rising.

That, in short, sums up the larger story of sustainable business: it has turned a corner to become a normal, even mundane, part of the business landscape. Investors and customers are paying closer attention. Addressing sustainability issues is no longer an optional, nice-to-do activity. It is an expectation, no more PR-worthy than safety, quality, employee retention, or customer satisfaction.

As we said, commitment and competence do not always lead to progress—at least not at the pace and scale required, say, to reverse the decline of fisheries and farmland, or reduce air and water pollution, or stabilize the climate. In some cases, it's a race against time, and the clock is ticking furiously.

But there is reason for optimism. In this fifth annual *State of Green Business* report, we take stock of the trends and indicators that tell how, and how well, the world of business is doing to address sustainability concerns.

Where are we headed? We turned to the sources, research, and lessons learned from the nearly 2,000 stories we reported during 2011 in search of trends and themes about the year ahead. Here, in no particular order, are the 10 key trends you need to know for 2012.

Commitment and competence do not always lead to progress—at least not at the pace and scale required. In some cases, it's a race against time.

1. SUSTAINABILITY COUNTS FOR CFOS

"Making the business case" has long been a mantra of sustainability advocates. After all, if sustainability doesn't create business value, why bother? For years, the business case focused on growing sales and cutting costs. But there are other aspects of sustainability—transparency, disclosure, compensation, and risk—that garner the attention of shareholders and others near and dear to the boardroom.

Enter the chief financial officer, historically an outsider to most corporate conversations about sustainability, which was viewed as "too soft" to be relevant to hard-nosed bean counters.

That's changing. According to a study conducted by Ernst & Young and GreenBiz.com, one in six (13 percent) respondents said their CFO was "very involved" with sustainability, while 52 percent said the CFO was "somewhat" involved. The survey was conducted for a forthcoming report from the two organizations, looking at trends in corporate sustainability reporting.

How to account for this? A variety of issues—among them, greenhouse gas emissions, toxic ingredients in products, and reliable access to water, energy, and raw materials—are increasingly seen as material risk factors that warrant scrutiny by shareholders, customers, and regulators. Growing calls for transparency and disclosure of sustainability impacts are requiring more, and more reliable, information about increasingly deeper levels of company operations and supply chains. Ratings and stock indices, such as those from Newsweek and Dow Jones, are being taken ever more seriously by companies, elevating the collection and dissemination of key data to the C-suite. Shareholder resolutions focusing on social and environmental issues made up the largest portion of all shareholder proposals in 2010 and 2011. That further bonds sustainability with board-level interest.

Shareholders aren't the only ones concerned about the impact of sustainability issues on stock price. In 2010, the US Securities & Exchange Commission issued guidance regarding companies responsibility to disclose material risks related to climate change. It notes that a company's CEO and CFO must certify that the company has installed "controls and procedures" enabling it to discharge its climate change disclosure responsibilities. That placed sustainability directly into the realm of controllership and financial risk management.

The Big Four accounting firms have taken notice. During 2011, two of them—Ernst & Young and Deloitte—published reports on CFOs and sustainability, while the other two—PricewaterhouseCoopers and KPMG—have taken a keen interest in the topic. They see new opportunities in helping CFOs bring the same level of diligence to sustainability reporting that they bring to financial reporting. In its report, Ernst & Young pointed to the growth of corporate sustainability reports, but especially to the growing wave of integrated reports that combine sustainability metrics and conventional financial reporting.

A handful of CFOs are starting to be heard on the topic. In 2011, for example, Kurt Kuehn, CFO of UPS and a 33-year veteran of the company, gave a speech at the Boston College Center for Corporate Citizenship on "Five Reasons the CFO Should Care About Sustainability" (a subject he wrote about on GreenBiz.com in 2010). He cited cutting costs, mitigating risks, generating revenue, driving innovation, and improving employee development and retention. "The one thing Wall Street hates the most is surprise," Kuehn told the audience. "So when a company confidently talks about how it will reduce risks and be successful for the long term, Wall Street listens."

The Big Four accounting firms have taken notice. They see new opportunities in helping CFOs bring the same level of diligence to sustainability reporting that they bring to financial reporting.

WILL CFOS EVER 'GET' SUSTAINABILITY?

A 2011 report from the global accounting firm Ernst & Young aims to help companies connect CFOs with their company's sustainability efforts. "Sustainability issues and financial performance have begun to intertwine," it begins. "CFOs are getting involved in the management, measurement and reporting of the companies' sustainability activities. This involvement has expanded the CFO's role in ways that would have been hard to imagine even a few years ago."

According to E&Y's report, there are three key areas where CFOs are playing a growing role in sustainability:

Investor relations. E&Y describes this as "the art of storytelling." Sustainability, says the report, "can be viewed as a new character introduced into a familiar plotline. The story is still about financial promise, but with a new twist: increasingly, a company's sustainability story is being heard and read by the same people who read its annual financial reports."

As sustainability issues intertwine with business strategy, institutional investors are starting to view financial and non-financial performance as two sides of the same coin. The report urges CFOs to "Work with your sustainability team to develop a sustainability story for your organization. If current trends continue, the CFO could be the one telling it."

Reporting and assurance. Transparent reporting of sustainability performance is important, and not just to investors and ratings agencies. E&Y points to the growth of corporate sustainability reports, but especially to the growing wave of integrated reports that combine sustainability metrics and conventional financial reporting.

Operational controllership and financial risk management. To quantify inputs and outputs related to climate change, CFOs will need accounting systems that track sustainability-related events that are significant from a financial reporting perspective.

2. SUSTAINABLE CONSUMPTION GETS BUY-IN

The years-long conversation about reducing consumption by getting consumers and others to buy fewer, more durable goods is gaining attention—albeit still in small, tentative ways. While there's not yet any sustainable consumption bandwagon, the companies and executives talking the talk are appearing downright mainstream.

Last year heard some corporate voices that could signal a new approach to curbing consumers' all-consuming passions—and create business value, to boot. The approaches range from incremental to radical—and from subtle to not-so-subtle. It may not yet be sustainable consumption, but it's definitely smarter consumption.

Patagonia and eBay made the biggest splash with their Common Threads Initiative, which encourages consumers to sell their used Patagonia clothing and gear online. At the beginning of the 2011 holiday buying season, Patagonia took out full-page newspaper ads featuring one of its jackets, with the provocative headline "Don't Buy This Jacket". It counseled, "Don't buy what you don't need. Think twice before you buy anything," and directed readers

to a web page where they were asked to sign a two-part pledge:

> Patagonia agrees to build useful things that last, to repair what breaks and recycle what comes to the end of its useful life.
>
> I agree to buy only what I need (and will last), repair what breaks, reuse (share) what I no longer need and recycle everything else.

As GreenBiz.com senior writer Adam Aston characterized the eBay relationship: "An auction function may not sound revolutionary in the retail world, but Patagonia's broader agenda here is an unorthodox, perhaps even radical, act for the fashion industry."

Another apparel company, Puma, is taking a different tack: making its clothes compostable. CEO Franz Koch said his company was working with partners on developing products on the principle of "cradle-to-cradle" design, in which every component can be recycled back into a comparable raw material, or composted harmlessly into soil. Nike, for its part, has its own initiative, called Considered Design, whose goal is to use the fewest possible materials and design for easy disassembly, allowing items to be recycled into new products or safely returned to nature at the end of their life.

It's not just clothing. Electronics retailer Best Buy launched a kind of subscription model for electronics in the form of its Buy Back plan, inviting shoppers to "future proof" their new purchases—for a price. Shoppers pay an upfront fee—say $69.99, for a laptop or tablet—and receive 10–50 percent of the value of the product back if it's returned within two years, assuming normal wear and tear. It's still unclear whether this will actually reduce waste or consumption, but it does introduce a new business model: the idea of electronics as a service, not a product.

Such efforts could finally bring life to the conversations on sustainable consumption conducted for many years by organizations like the World Business Council on Sustainable Development, the United Nations Environment Programme, and the World Economic Forum. And while the list of companies participating in those conversations is long—including Coca-Cola, General Motors, Henkel, Nestlé, Nokia, Procter & Gamble, SC Johnson, Sony, and Unilever—few of these companies have had much to show for it, in terms of radical changes in products, serivces, or business models.

Perhaps these global brands can learn from the new generation of startups—some for-profit, others nonprofit—known collectively as "mesh" companies. The term, coined by entrepreneur and marketing guru Lisa Gansky in a book of the same name, describes companies that offer services instead of products—car sharing instead of car ownership.

Already, there are dozens of mesh companies—a database Gansky created has more than 2,000. A sampling: A Box Life (keeps shippable cardboard boxes in use longer); GoLoco (ride-sharing system that notifies users when their friends or interest groups are going places they want to go); Instant Offices (matches businesses with available office space); Kopernik (connects tools and people where they are most needed); and Local Dirt (helps consumers buy, sell, and find local food).

Mesh companies could represent the future of sustainable consumption—and the future of commerce itself, at least for some product categories. If consumers catch on to the idea that access may trump ownership, it could be a win-win-win: companies make more money from less physical stuff; consumers get exactly what they need, at lower cost and without the worry of planned obsolescence; and the planet is spared countless tons of waste.

Global brands can learn from the new generation of startups—some for-profit, others nonprofit—known collectively as "mesh" companies.

3. GREEN GAMIFICATION SCORES POINTS

Making sustainability fun and accessible to the masses has long been a challenge for companies, government agencies, activist groups, and others. While the über-notion of "saving the planet" may be compelling, many of its constituent activities are easier said than done: reusing and recycling, turning off lights, buying greener products, driving less, and the like. That may partly explain why so many of us—both at home and in business—don't engage in greener behaviors, even when we know exactly what to do.

That could change, thanks to gamification, an admittedly kludgy word that describes using something called "game mechanics"—points, badges, leaderboards, and other schemes—to make ordinary activities fun and rewarding. Games have long been a business tool for effecting behavior change—witness the decades-long success of frequent-flyer and other loyalty programs that reward customers for repeat business. In the past year or so, everyone from Samsung and Salesforce to Nike and the NHL have harnessed the power of games to incentivize and reward customers and employees.

Increasingly, games are part of companies' sustainability toolkits, providing rewards for making good, green choices. Consider the Nissan Leaf, one of the first mass-produced electric vehicles. Drivers using the car's "eco mode" software keep track of such variables as speed and power usage, receiving constant feedback from a display behind the steering wheel so they can improve upon efficiency. Their achievements are seen as on-screen trees. An online portal connected to the car's dashboard lets drivers know how well they are conserving energy, compared with other nearby drivers. The most efficient drivers receive virtual bronze, silver, gold, and platinum "medals." What had been solely a matter of personal virtue—driving more efficiently—has become a community activity.

Similarly, the Ford Fusion Hybrid uses a Tamogochi-style game, in which a small dashboard plant grows and shrinks based on green driving practices.

SAP, the German software giant, has harnessed games as a key part of its employee-engagement program. "I haven't seen a single sustainability application that didn't use game mechanics," Mario Herger, SAP Labs senior innovation strategist, told GreenBiz last year. In Germany, for example, SAP employees earn points through a carpooling game called TwoGo, aimed at making carpooling easy and socially cool. Employees win points by entering information about themselves; the game matches them with drivers going where and when they need to get to work. Riders also earn points by such things as answering questions about their fellow riders. The game has been credited with taking thousands of cars off the road while helping build social ties among employees. Since many of these vehicles are company cars, there are direct cost savings to SAP.

Such technologies represent the next big leap in fomenting behavior change around sustainability. As consumer product companies jump on the gamification bandwagon, some are likely to use it to promote green behaviors—and sell green products. The only question is one of market saturation: how many ways individuals will be willing to engage with companies and causes through their mobile phones and devices? If companies aren't able to keep such "games for good" fresh and exciting, continually upping the ante when it comes to rewards and incentives, it will be a short-lived phenomenon. By the end of the year, we'll know whether it will be "Game On"—or "Game Over."

As consumer brands jump on the gamification bandwagon, some are likely to use it to promote green behaviors—and sell green products.

CONVERGENCE AND THE NEXT BIG OPPORTUNITY

VERGE

It's been said that everything that can be mashed together will be. That's the recipe for the new-media landscape, not to mention fusion cooking. It's also the basis for a technology evolution that we've been tracking: the convergence of energy, information and communications, building, and transportation technologies. That mashup, which we've dubbed VERGE, was the basis for three executive roundtables in 2011, in Shanghai, London, and San Francisco. In 2012, GreenBiz Group is presenting a three-day VERGE conference in Washington, D.C., March 14-16, followed by VERGE events in Hong Kong, London, Rio de Janeiro, and New Delhi, as well as other VERGE events in the United States.

VERGE has the potential to transform how we live, work, travel, shop, and play, by creating a new generation of smarter, innovative products and services. In some cases, VERGE technologies will radically improve efficiencies of today's vehicles and transportation systems, buildings, urban infrastructure, industrial production, and other energy- and resource-intensive activities. Beyond that, VERGE has the potential to invent new products and services, even new industries, much like other technologies—such as the Internet, broadband, smart phones — have done in recent years.

We're already seeing the ingredients for this convergence:

- **Energy technology** is becoming decentralized, cleaner, better managed, and easier to store.
- **Information and communications technologies** are making every device, building, and vehicle smarter, able to connect into a vast Internet of things that can be addressed, monitored, controlled, and optimized.
- **Buildings** are becoming more intelligent and efficient, better able to optimize energy and resource use and enhance human comfort and productivity, with the potential of becoming net-positive, from the standpoint of their environmental footprint.
- **Vehicles** are getting smarter, too, able to communicate with their drivers, other vehicles, and their surroundings, becoming safer and more efficient while connecting passengers and fleet managers to a broader transportation and energy grid.

The early stages of the VERGE vision are coming to life in pilot projects and demonstrations around the world: Autonomous vehicles that can travel efficiently and safely with little or no driver interaction. Hyper-efficient, zero-energy buildings able to generate and store energy, variously buying or selling power to the grid. Cities embedded with intelligence that move traffic, connect people, reduce emissions, enhance safety, and maximize well-being. Platooning technologies that allow cars to travel at close range at high speed, reducing congestion and emissions.

VERGE holds the potential to make gigaton reductions in greenhouse gas and other emissions, engender step-change improvements in energy efficiency, accelerate the growth of renewable energy, and bring dramatic advances in materials efficiency.

To learn more, visit GreenBiz.com/verge.

4. SUSTAINABLE MOBILITY HITS THE ROAD

While the public and media have focused on electric vehicles, others are taking the bigger view. Smart transportation systems aim to move people and goods around more quickly, more safely, and with less energy and pollution.

This is no idle matter. The world crossed a significant milestone in 2011: There are now more than 1 billion cars and trucks on roads globally, up from 980 million at the end of 2009. That number is expected to double by 2020. Combine that with two other recent thresholds—the seven-billionth world citizen and the fact that a majority of humanity now resides in cities—you have the makings for one hell of a global traffic jam.

The United States boasts the highest density of cars and trucks—one for every 1.3 people—but the 1 percent annual rate of growth pales compared with China, India, and Brazil, where annual vehicle growth rates are 27.5 percent, 8.9 percent, and 9 percent, respectively, according to the trade journal Ward's and J.D. Power. In many of the world's largest cities, drivers are going nowhere fast. Mexico City; Shenzen and Beijing, China; Nairobi, Kenya; Johannesburg, South Africa; and Bangalore and New Delhi, India face the highest congestion, according to the 2011 IBM Commuter Pain Index. (By comparison, Los Angeles ranked 12th, New York City 15th, and car-choked Houston didn't even make the top 20.) The index ranks the emotional and economic toll of commuting in each city.

IBM, which sells control systems to make transportation systems smarter and more efficient, is one of several companies for which backups, bottlenecks, and snarls represent a vast opportunity. Another is Cisco; its Connected Urban Development initiative aims to harness information and communications technology to make fundamental improvements in transportation efficiency. Providers of such technologies hope to garner a slice of the multi-billion-dollar pie found in easing congestion in cities.

The car makers are seeing their business models upended by a new business model that puts the brakes on vehicle ownership. First among these is Zipcar, the largest of dozens of companies offering "mobility on demand," better known as car sharing—the ability to easily find nearby vehicles to rent by the hour, an alternative to car ownership or traditional car rental. Zipcar and dozens of other car-sharing services are being joined by big players: Hertz (HertzOnDemand), Enterprise (WeCar), and U-haul (uhaulcarshare). While most are currently available in only a handful of cities, they will be widespread in the next few years. Last year, for example, Ford teamed up with Zipcar to make its vehicles available for car sharing on US college campuses.

Behind that business model is an even more disruptive one: peer-to-peer car-sharing services, in which anyone can make his or her vehicle available to others on an hourly basis. In the United States, RelayRides and Getaround are making inroads in P2P, as it is known, allowing car owners to make money renting their vehicles when they would otherwise sit idle, which is about 95 percent of the time. Software allows anyone with a smartphone to find a nearby rentable vehicle, and vehicle owners get to decide when, where, and to whom to rent—and for how much. In a nod to the vast potential of P2P, GM launched a partnership with RelayRides last year to allow GM owners to rent out their idle vehicles using their mobile phone and GM's OnStar service.

These are the first signs of a future not far down the road, where owning a car is no longer a rite of passage or even a status symbol, and where "access to mobility" becomes the desired norm. After all, turning every car into a green one isn't much help if no one can get from here to there.

In many of the world's largest cities, drivers are going nowhere fast. Turning every car into a green one isn't much help if no one can get from here to there.

5. CLEANTECH SURVIVES A CRISIS OF CONFIDENCE

Let's be clear: The perception of clean technology these days is far less sunny than the reality.

The perception, at least in the political arena, is that cleantech was a promise that largely failed, like universal health care or a balanced federal budget. After all, 2011 saw a few spectacular swan dives by promising companies, several of which had received US government funding, at least one of whose name is destined to be synonymous with wasteful taxpayer subsidies. The prevailing narrative is that solar and other clean technologies have not lived up to their promise and remain costly and unreliable, out of reach for most mainstream uses.

The reality is quite different. Cleantech is maturing, growing, and doing reasonably well. In 2011, for the first time, power plants operating on solar, wind, and biomass energy garnered more investment than those powered by natural gas, oil, and coal—$187 billion for renewables compared to $157 billion for fossil fuels, according to Bloomberg New Energy Finance. The group predicted that renewable energy investments will double over the next eight years.

Solar energy, for all the high-voltage company failures, hit record growth in the United States—more than 1,000 megawatts installed during the first three quarters of 2011, compared with 887 MW in all of 2010, according to GTM Research and the Solar Energy Industries Association (SEIA). The solar market grew globally, as well. According to a report by GTM Research and Bridge, India is facing a perfect storm of factors that will drive solar photovoltaic adoption at a "furious pace over the next five years and beyond." And NDP Solarbuzz forecast that in 2011, China would surpass United States and Japanese solar installations for the first time.

2011 was also a boom year for wind energy, which now provides 20 percent of electricity in Iowa and South Dakota, according to the American Wind Energy Association, and at key moments surges to 50 percent in Colorado. The market research firm Lucintel predicts that the world market for wind energy will grow at a compound annual rate of 12 percent for at least the next five years. In some parts of the world—Brazil, for example—the price of wind energy is now below that of natural gas.

All this turmoil notwithstanding, the United States became a net exporter of solar products to the tune of $1.8 billion in 2010, according to GTM Research and the SEIA, primarily through sales of solar manufacturing equipment and polysilicon, solar modules' main ingredient.

With all this growth, why are companies failing? It has to do largely with natural technology growth cycles, seen with nearly every technology over the past century, from cars to computers to cell phones. As technologies mature, industries consolidate, with a handful of winners emerging. In the early 1900s, for example, there were more than 1,000 American automobile manufacturers, from Acme (1903-11) to Zip (1913-14). All but a few are gone.

As technologies mature, the winners become the value-added players—in solar, companies like SolarCity, Sungevity, and SunRun—non-manufacturers all—which provide turnkey solar installation for homes and businesses, often for little or no money down. So, too, with other clean technologies, like LED lighting, where bulb makers are getting squeezed by ever-dropping prices, but downstream value-add players like Adura and Digital Lumens, which package LED bulbs into modules for commercial use, are growing. Rodrigo Prudencio, a partner at Nth Power, a longtime energy-tech investment firm, calls it finding new value in "old" clean

Cleantech is going through a reset, not a retrenchment. And it portends more roiling of cleantech markets.

GREEN BUILDINGS 2011: LEED BOUNCES BACK

GREEN BUILDING MARKET AND IMPACT REPORT 2011

In 2010, the market for green buildings suffered the belated impacts of the economic downturn, with plans to construct new LEED-certified buildings dropping precipitously over 2009. But 2011 saw a roaring return to business as usual, with "usual" here meaning "rapid growth." The 2011 Green Building Market & Impact Report—written by Rob Watson, CEO of EcoTech International and senior contributor to GreenBiz.com, and a founder of the LEED rating system—tracked for the fourth year the current and future state of LEED and the environmental benefits of green buildings.

- **Registrations Bounce Back:** In another sign of promising future growth, registrations of new projects across all LEED standards grew by 45 percent over 2010, although newly certified LEED buildings grew by just 2.6 percent, a slowdown to LEED's previous meteoric growth.
- **LEED Raises the Bar:** Among the biggest developments this year was the maturing of the LEED 2009 standard, which drove buildings to be even more energy-efficient—averaging 30 percent energy savings over conventional buildings—as well as more "location-efficient." Constructing LEED buildings near transit, homes, and offices reins in sprawl while saving drivers time and money: In 2011, the location of LEED buildings saved drivers 5.7 billion miles driven.
- **Reduced Impacts Across the Board:** In addition to saving energy and commute miles, LEED buildings in 2011 resulted in major reductions in water use—48 billion gallons of water saved in 2011 alone—as well as large reductions to the nation's carbon footprint. Last year, LEED buildings saved 9 percent of the nation's total non-residential energy use.
- **Existing Buildings Certifications Taking Off:** Perhaps most importantly, this year for the first time the amount of square feet certified under LEED for Existing Buildings surpassed the figure for New Construction. This is pivotal not only because square footage is the key benchmark for real impacts of LEED, but also because there is vastly more existing building stock, and momentum behind greening our current facilities will be fundamentally important to making the massive energy and emissions reductions we need.

technologies, noting: "Value creation around commoditization happens in any industry."

So, cleantech is going through a reset, not a retrenchment. And it portends more roiling of cleantech markets, as competition continues to squeeze out weaker or inefficient players and new, innovative companies enter the field. At the end of 2011, the venerable energy industry journal Platts noted: "Heading into 2012, renewable energy is entering a new phase, with winners and losers emerging both within renewable energy sectors and as part of larger energy markets. Renewables are no longer just one energy source among many but in some markets are a direct competitor with fossil fuels."

Cleantech is more than just electricity, of course, though these technologies often get the most attention. It also includes next-gen electric vehicles, advanced materials, biofuels, water efficiency and purification, and more. Each of these is maturing at its own pace, as technologies and markets develop and grow. And each holds great promise to address critical societal needs.

Put together, it suggests that cleantech still has bright times ahead.

6. ENERGY EFFICIENCY GAINS STAR POWER

Clean technology may have been a political hot potato in 2011, but energy efficiency is becoming downright cool.

A major overhaul at the iconic Empire State Building helped raise the profile of energy efficiency. That project—which included replacing 6,500 windows, adding insulation, upgrading lighting, and installing a digital wireless monitoring system—is powering a 38 percent annual energy reduction and $4.4 million in annual savings. Publicity surrounding the project—from the likes of Presidents Clinton and Obama, not to mention major flogging by the companies and nonprofits involved with the $13 million project—amounts to a towering achievement for energy efficiency, which has remained in the background, an unheralded hero, for years.

The Empire State Building wasn't the only aging star getting an energy makeover. Sixty-odd blocks downtown, the 104-year-old New York Stock Exchange building replaced more than 7,000 square feet of windows with super-insulating SeriousGlass. The windows were designed to increase the thermal performance by almost 60 percent and reduce solar heat gain by 40 percent compared to the original glass. Clearly, there's a bull market for saving energy.

Such initiatives are destined to grow, thanks in part to federal government efforts to promote building efficiency, along with other initiatives by US cities and states. But the impacts are limited to date. As our Energy Efficiency indicator shows, progress has slowed or reversed in the past couple years (see page 47).

It's not just buildings. The federal government issued the first-ever efficiency standards for heavy-duty trucks and proposed new standards for passenger vehicles. The truck standard will reduce fuel use by up to 23 percent, depending on truck type, while the passenger vehicle standard should bring average new vehicle fuel economy to just under 50 miles per gallon by 2025. The feds also introduced new efficiency standards for appliances like residential refrigerators and air conditioners and furnaces.

The big question is whether consumers will join in. To date, individuals haven't found much appetite for efficiency measures, short of turning off switches or swapping out a few light bulbs—if that.

But that's changing. Cool technologies are starting to make home energy efficiency more compelling, such as a smart thermostat from Nest Labs, created by one of the designers of Apple's iPod. Smartphone apps from companies as varied as ecobee and General Electric allow for near-real-time information about home energy use. Facebook joined forces with Opower and the Natural Resources Defense Council to allow members to benchmark their home energy use against a national database of millions of homes, as well as with their friends. Best Buy announced plans to start carrying home energy management tools, and Pike Research predicted that worldwide users of home energy management systems will reach 63 million by 2020, up from just over 1 million in 2011.

Clearly, we are only at the beginning of a new era of energy efficiency, as continuous innovations in techno-wizardry make our homes, vehicles, office buildings, appliances, and devices increasingly efficient. The ability for anyone to get real-time, detailed information about their energy use portends a new democratization of energy among consumers. The question, of course, is whether all of this intelligence will actually smarten, and change, individual habits.

7. 'BIG DATA' CREATES BIG OPPORTUNITIES

Billions of bits of data are streaming in from everywhere: buildings, vehicles, manufacturers, warehouses, government agencies, credit card transactions, traffic signals, the electric grid, and just about anything else that is connected—wired or wirelessly—to something else. This "internet of things," as it's been dubbed, already consists of a trillion connected devices, and it's growing exponentially.

Consider: Within a decade, the number of mobile phones and devices globally will grow to more than 10 billion—each a powerful computer capable of sending large amounts of data. Meanwhile, nearly 2 zettabytes—that's 2 trillion gigabytes—of data were created and stored in 2011, according to IDC. According to IBM, more than 2.5 quintillion bytes—about 2.5 billion gigabytes—are created every day. For companies, tracking and making sense of all this data is like drinking from a fire hose. While nearly every device is getting smaller and more efficient, information is getting much bigger and unwieldy.

Welcome to the world of "big data," the IT world's latest catch phrase. It refers to data sets too big to be accessed with traditional databases and spreadsheets. They require a new set of tools and techniques, including massive computing power, vast quantities of storage, and the human resources needed to turn it all into knowledge and action. Used well, big data can lead to accurate predictions of everything from crop yields to consumer habits. It's become axiomatic that companies' ability to harness big data will become a core competitive strategy.

Big data has big implications for sustainability. Consider, for example, the emerging smart grid, the interconnected collection of utility plants, rooftop solar panels, wind turbines, and other generation systems, along with every device in every building that uses energy. In the coming years, hundreds of millions of households and businesses worldwide will have "smart meters" installed by their local utilities, each one spewing real-time data about energy use. Collecting and analyzing all of that data will enable utilities and grid managers—as well as their customers—to ensure a steady and reliable energy supply, predict rates, and make decisions accordingly. That, in turn, will better manage existing power plants, reducing the need for new ones and reducing emissions overall.

Or consider the data streaming from an office building equipped with sensors and smart devices. IBM placed more than 250,000 sensors within a 3.3 million-square-foot manufacturing site in Minnesota. It sampled only a subset of them every 15 minutes, collecting 2.15 million points of data per month. A Microsoft pilot at its Redmond, Wash., campus looked at public and private data for a subset of its buildings and gathered 500 million data points *a day*. All this data can allow you to make buildings more efficient and more comfortable—if you know how to harness it.

Much of the data doesn't sit still. For example, as smart, electric-powered cars hit the roads, they'll be streaming data to and from the electric grid, IT-embedded "smart roadways," charging stations, the driver, other vehicles, and navigational equipment—all at the same time. Collecting and crunching all this data in microseconds could go a long way toward allowing vehicles to travel hyper-efficiently and safely, saving time and fuel.

These are glimpses into the tsunami of information that's bearing down on companies, governments, and others—the leading edge of a wave of products and services harnessing big data to reduce waste and improve efficiency, and make big profits along the way.

While nearly every device is getting smaller and more efficient, information is getting much bigger and unwieldy.

FOUR TRENDS SHAPING THE PROFESSION IN 2012

GREENBIZ SALARY SURVEY 2011

Ten years ago, the formal role of the sustainability professional didn't exist. Today, the sustainability executive has emerged as a unique role in industry. At GreenBiz Group, we gain tremendous insights from the more than 70 members of the GreenBiz Executive Network (GBEN), our member-based, peer-to-peer learning forum for sustainability professionals. We bring members together three times a year for a day of face-to-face meetings. They help us—and each other—understand how leaders with limited staff and huge mandates are working to operationalize sustainability.

Below are four trends we'll be focusing on in 2012 as we look at where the profession is headed. Through interviews, case studies, and surveys of our GBEN members as well as our 3,000-member GreenBiz Intelligence Panel, we'll highlight how the practices of sustainability leaders are transforming their companies.

- **Strategy Is Job No. 1.** The primary task for all sustainability executives is helping senior management develop a sustainability strategy that syncs with their company's overall goals. According to a recent GreenBiz Intelligence Panel survey, 85 percent said this has placed sustainability permanently on their company's agenda. Dow Chemical is an example of a company working to incorporate the economic value of nature into its strategies, goals and decision-making, while Intel has aligned a portion of its employees' compensation with environmental criteria.
- **Raising the Bar.** Leading companies are working to operationalize sustainability by setting the bar high and targeting what *Good to Great* author Jim Collins calls "big, hairy, audacious goals." Campbell's Soup has set a 2020 goal to cut its product portfolio's environmental footprint in half. IBM requires suppliers in 90 different countries to install management systems to track environmental data.
- **Strange Bedfellows.** To meet big goals, companies are establishing unique partnerships. At a 2011 GBEN meeting, McDonald's described its 20-year journey working with NGOs as different as World Wildlife Fund and Greenpeace. For those outside the sustainability profession, that's as surprising as hearing that Patagonia advised Walmart on its sustainable supply-chain efforts.
- **Built to Last.** Last year, budgets and teams grew for many sustainability departments, despite the economic doldrums. Eighty-six percent of large companies now have at least one person focused full time on sustainability. But there's still no consistency as to where the role reports. While a number of sustainability executives report into public affairs, many others report into operations, marketing, HR or general counsel. That may not be a bad thing. Sustainability executives must use influence to leverage their efforts, and GBEN members tell us their ability to work across functions is more critical than where in the company they sit.

For leadership companies in sustainability, 2012 may look unglamorous to the outside world. After picking low-hanging fruit, the work becomes much more challenging—a series of incremental improvements built upon earlier improvements. But these efforts will clearly differentiate the leaders from the rest of the pack.

—John Davies, VP and Senior Analyst, GreenBiz Group

8. FOOTPRINTING WALKS A FINE LINE

The idea of calculating one's "footprint" began in the 1990s with the notion of an "ecological footprint," a measure of human demand on the Earth's ecosystems. In those terms, a footprint is a standardized measure of demand for natural capital relative to the planet's capacity to regenerate it. Organizations like the Global Footprint Network (whose founder Mathis Wackernagel helped popularize the concept) use footprint calculations to answer such confounding questions as "How many Earths would it take if everyone lived like us?"

Today, companies are conducting exercises to determine their carbon footprints, water footprints, toxic footprints, energy footprints, land footprints, even paper footprints. For better or for worse, "footprint" has become variously synonymous with "analysis," "impact," "measurement," or "consumption"—or even "emissions."

This is largely a step forward, in that it shows that companies are taking stock of their environmental impacts, presumably with the intention of reducing them. While purists may scoff at the pitter-patter of little footprints, decrying them as a weak substitute for more holistic analyses, the talk of footprinting has become fashionable among companies. As "footprinting" becomes increasingly commonplace, however, the term is being used, and misused, in a growing number of ways. It's hardly a case of greenwashing—that is, of knowingly misleading, either by omission or misrepresentation. But the term risks being rendered meaningless, thereby distorting what began as a useful scientific concept.

Carbon remains the principal focus of footprinting: an analysis of how much carbon is emitted in the making, or the use, or the life cycle of a product or service, or the operation of a building or company or some other entity or activity. In many companies, this leads to commitments to make reductions. For example, the North American arm of LG Electronics announced in late 2011 plans to halve its carbon footprint by 2020. Also last year, Verizon unveiled a carbon footprint metric to help the telecom giant track how efficiently it delivers data to its customers—specifically, the amount of carbon dioxide emissions produced while moving a terabyte of data. Five major hotel chains—Fairmont, Hyatt, MGM, Hilton, and Marriott—joined forces to create a single methodology for measuring and communicating their carbon footprints.

Most such efforts dovetail with growing demands for corporate transparency of environmental impacts or emissions (see Carbon Transparency, page 81). There's not necessarily a legal mandate for companies to disclose such things, but a growing number are doing so, pushed by institutional investors, customers, activists, and others. In 2011, more than 3,000 companies, including more than 80 percent of Global 500 firms, voluntarily reported at least some of their carbon emissions, water management and climate change policies to the Carbon Disclosure Project.

Some carbon footprinting exercises seem, well, silly. Over the past year, we've learned the carbon footprint of unwanted emails (a.k.a. "spam")—roughly 0.3 grams of carbon dioxide per message, in case you're wondering. (That, it turns out, is far more deleterious than the footprint of a tweet—just 0.02 grams per 140 characters.) Kudos to those who take the time to calculate the various activities of our lives, for whatever it's worth.

To the extent that footprinting develops and propagates new methodologies that become standards within or among industries, such exercises stand to make a significant contribution. Case in point: More than 30 companies and

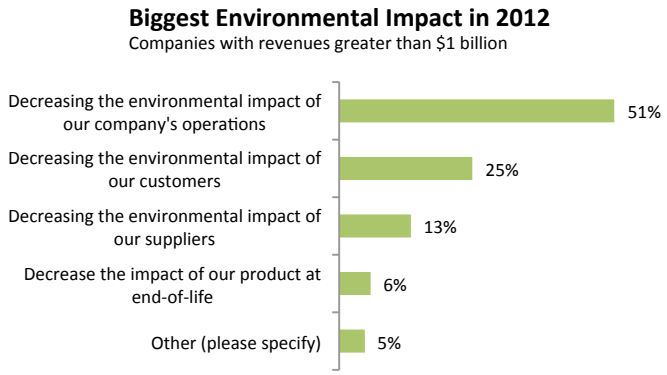
The paradox about sustainable business is that there are too many standards and not enough metrics.

BUDGETS AND JOBS: BACK ON TRACK?

Businesses are back to investing in their green efforts. Driven by customer demand and senior leadership, corporations large and small continue to drive growth in the green economy.

In 2008, we created the GreenBiz Intelligence Panel to take a monthly pulse of the green business world. Twice a year, we ask the panel's nearly 3,000 members for their views on key economic indicators. Our December 2011 survey garnered 282 responses, two-thirds from companies with revenues greater than $1 billion. The indicators remain positive for the green economy, including spending, employment, and product development. Some key findings:

- **Fewer Job Openings, but Growth Continues.** In July 2011, we reported that there were jobs, but they weren't new jobs. Thirty percent of large companies in mid-2011 posted open requisitions that would not add to their department's headcount and 22 percent reported openings that would increase headcount. At year's end, the numbers have flipped, with 30 percent adding new jobs and only 15 percent making replacement hires. Another positive sign? Hiring freezes were reported by only 3 percent of companies, compared to 8 percent in mid 2011.



- **Investments Stay the Course.** Eighty-six percent said their 2012 environmental, health, and safety spending will be equal to or greater than in 2011, a slight dip from a year prior. After dipping to 79 percent last summer, those who cite increasing investments rose to 84 percent by year's end.

- **Economic Pressure Turns Business Green.** Forty-two percent said economic pressures caused them to invest more in environmental and sustainability activities while only 33 percent indicated they cut back.

- **New Sheriff in Town.** During the summer of 2010, the number of respondents anticipating increased regulation within the subsequent four years peaked at 92 percent. That number has since plummeted to 72 percent—its lowest point since we began the survey. As we've seen for years, the locus of action is around business, not regulatory, demands.

—John Davies, VP and Senior Analyst, GreenBiz Group

organizations—including Nike, Gap, Patagonia, and Walmart—last year joined forces to create the Sustainable Apparel Coalition, with the first item on their agenda being the creation of a tool to measure the environmental impacts of clothing. Similarly, the Sustainability Consortium—convened in 2009, initially by Walmart and now boasting a membership of nearly 80 retailers and consumer packaged goods companies—has set out an ambitious agenda to create standards and tools to collaboratively develop life-cycle–based standards and measurement tools for consumer products.

And then there's Puma, which raised the bar for such analyses by putting a dollar value on it impacts on nature. The shoe and sportswear company is measuring its use of ecosystems and plans to determine its economic impacts on ecosystem services, which is basically anything that nature provides: clean water, crops, soil formation, wildlife habitat, protection from storms, and the like. Puma's effort comes closest to the original notion of understanding one's full ecological impacts and, if emulated by others, stands to bring the idea of footprinting back in step with reality.

9. SUSTAINABLE CITIES TAKE CENTER STAGE

While national governments grapple with economic issues and policy gridlocks, pushing sustainability measures to the side, cities are picking up the mantle. Some of the world's largest cities are emerging as laboratories of innovative technologies, business models, and efficiency measures, many of them with salutary environmental and social outcomes. To the extent that the green economy flourishes, it is becoming clearer that it will likely be a bottom-up, grassroots evolution.

It makes sense. Cities are where more than half the global population lives. In developing countries, urban growth is exploding, stretching demands for food, water, energy, jobs, and mobility to the breaking point and beyond. In the developed world, the need for upgrading older infrastructure is driving leaders to invest in new, cleaner and more-efficient technologies.

During 2011, the role of cities in sustainability became increasingly evident. New York City Mayor Michael Bloomberg and former President Bill Clinton merged their respective sustainable city initiatives to create the C40 Cities Climate Leadership Group, a network of large cities around the world committed to implementing climate-related actions at the local level. The combined group, in turn, formed a partnership with the World Bank to help cities accelerate actions to reduce greenhouse gas emissions.

A sampling of cities' sustainability initiatives, courtesy of C40:

- Seoul plans to retrofit 10,000 buildings by 2030.
- Austin has a zero-waste plan for 2040.
- London aims to have 100,000 electric vehicles on the streets by 2020.
- Buenos Aires is implementing a network of dedicated bus and taxi lanes to improve fuel efficiency.
- Tokyo is introducing higher energy-efficiency standards for large urban developments.
- São Paulo plans to reduce the use of fossil fuel on public transportation by 10 percent each year, aiming for 100 percent use of renewable fuels by 2017.

Such ambitious projects build on efforts these and other cities already have made over the past few years to divert waste from landfills, reduce greenhouse gas emissions of municipal operations, harness a growing percentage of power from renewable energy, purchase electric or ultra-efficient vehicles, and leverage their substantial buying power toward purchases of other greener goods and services. Leadership examples abound, from Copenhagen to Curitiba.

Some future-focused cities are helping to usher in a new wave of IT-enabled "mesh" businesses that promote sustainability by facilitating access to transportation services, real estate, tools, and many other things. As mesh companies grow and succeed—and as cities recognize the benefits they bring in the form of such things as economic development, reduced congestion, and social connectivity—a few cities are beginning to identify and nurture the conditions that make mesh businesses successful.

Mesh builds on an older but still growing trend to support local economies, especially local growers and producers of food. Farmers markets, community-supported agriculture, food cooperatives, food swaps, slow-food movements, and more are flourishing in both struggling and well-to-do neighborhoods, and they are providing the inspiration for other, non-food-related community enterprises. All of these are helping to reinvigorate cities in both the developed and developing worlds.

The latest developments in information and communications technologies are also spurring cities to create new, smarter infrastructure systems that promote energy and resource efficiency while providing new products and services. For example, the convergence of energy, information, building, and transportation technologies—which is the basis for a technology framework we've dubbed VERGE—is spurring the development of smart grids, smart buildings, smart transportation systems, and more. (More on VERGE, page 10.) Each of these holds great promise to make cities more livable and efficient—in a word, sustainable.

The implications for business are implicit, if not explicit: Cities are gaining enormous power to create markets for both local and sustainably produced goods and services, in some cases helping create economies of scale that make these things cheaper and more widely available. Such efforts further support business by making cities more desirable places to live, shop, and work, attracting employees and customers. City leaders recognize this. A survey by the Carbon Disclosure Project and KPMG of leaders of 58 cities around the world, representing 8 percent of global population, found that nearly 8 in 10 believe the physical impacts of climate change directly or indirectly threaten the ability of local businesses to operate successfully. As cities compete to attract companies and a high-quality workforce, sustainability will likely be part of their competitive strategies.

Purists scoff at the pitter-patter of little footprints, decrying them as a weak substitute for more holistic ecological analyses.

One development from the last year may epitomize cities' growing potential as hotbeds of sustainable innovation. The cutting-edge conference TED, which brings together people from the worlds of technology, entertainment, and design to promote "ideas worth spreading," each year grants a TED Prize to a visionary individual. For 2012, it designated "The City 2.0" as its prize winner, for the first time granting the prize to an idea, not an individual. TED's organizers are using the prize to solicit ideas for what The City 2.0—"a real-world upgrade tapping into humanity's collective wisdom"—should be and how to make it a reality.

We'll wait to see what that collective wisdom brings forth. At its best, it will unleash the brightest ideas from around the world for redesigning how people live, work, play, travel, and shop in more sustainable ways.

10. NON-NEWS IS GOOD NEWS

What passes for state of the art in sustainable business rises continually from year to year. The same cannot be said of the state of the art of public relations and the media, mainstream and otherwise, to which they pitch story ideas. So many of the stories sent our way, both by in-house and outside PR professionals, are of the been-there-done-that variety. So 20th century. They're simply not new—or news.

Many of the things companies are doing have become so common that they are not, from a journalistic perspective, newsworthy. Two decades ago, the news was that a company achieved ISO 14001 certification, attesting that it had rudimentary processes in place to address its environmental impacts, particularly in the case of an accidental spill or emissions release. Every manufacturer issued press releases that managed to point out some "first"—the first ISO 14000-certified company in a given city, a given industry, or something else. For a time, ISO 14000 certification was, newsworthy. But not for long.

Next, it was companies issuing a sustainability report—something that is still considered pitch-worthy by some PR types, even though sustainability reporting has become commonplace (see Corporate Reporting, page 38). After that, it was companies boasting about switching to recycled or reduced packaging (see Packaging Intensity, page 70), or having a LEED-certified building (see Green Office Space, page 61), or setting a greenhouse gas reduction goal (see Carbon Intensity, page 27). In all but extreme cases, these are non-stories, part of what's considered business as usual—barely more newsworthy than a company filing its taxes on time.

Today's non-stories are about zero-waste factories, energy-efficiency building upgrades, and supplier surveys or questionnaires. So many companies are doing these things that it is rare that any one of them is considered "news."

The growing body of non-news is good news for businesses, consumers, and the planet, if not for PR professionals. Yesterday's leadership initiative is today's societal expectation. Last decade's cutting-edge practice is today's standard operating procedure. Bold, audacious sustainability goals of the past are now considered business as usual.

Of course, a lack of newsworthiness shouldn't mean that these things aren't worth doing. They are, but for sound business reasons, not for scoring PR points. Companies create green buildings because they are more cost-effective and better places to work, with higher productivity and occupant satisfaction. They make energy upgrades because they save money and improve operations. They report on their sustainability performance because customers and investors demand it. They set greenhouse gas reduction goals because doing so can reduce long-term risk.

All of which begs the intriguing question: What will be newsworthy in 2012? What corporate commitment or achievement during the year will capture the public's imagination, set a new standard, or even disrupt markets? And what activities will become no longer newsworthy—things so commonplace that a press release, PR pitch, or executive speech about them will cause our collective eyes to roll?

As journalists and analysts of the sustainable business scene, these are the questions that make our juices flow, that motivate us to separate the newsworthy stories from the rest—a never-ending quest for the new, new thing.

THE COMING SHIFT TO 'CLIMATE PREPAREDNESS'

By Marc Gunther, Senior Writer, GreenBiz.com

Last December, thousands of government officials, corporate executives, and activists met in Durban, South Africa, for high-level climate talks. They went home with an agreement ... to keep talking. Meanwhile, we're emitting more carbon dioxide every year, and atmospheric concentrations of greenhouse gases are steadily rising. If carbon dioxide levels were somehow to stabilize now—they won't—the world will keep warming. The bottom line: Global action will not prevent climate change. So the world needs to learn how to prepare for it.

Increasingly, businesses are starting to do just that. Utilities, the oil and gas industry, agricultural companies, and insurers are building assumptions about rising temperatures and extreme weather events into their scenario planning. Adaptation—some people prefer to call it climate preparedness—is simply the effort to protect people, places, and corporate assets from known risks. The payoff from investing in adaptation could be substantial. In 2011, insured losses in the United States from natural catastrophes, including tornadoes, floods, and hurricanes, topped $105 billion, breaking the record of $101 billion set in 2005, the year of Hurricane Katrina, according to Munich Re, the world's largest reinsurance firm. Some of those losses had nothing to do with climate change, but others did.

Let's get specific. Entergy, an $11 billion-a-year utility company based in New Orleans, commissioned a Gulf Coast Adaptation Study that has opened up conversations with customers and elected officials about preparing for a warming climate. Not surprisingly, the company got focused on the problem after Hurricanes Rita and Katrina hit in 2005, followed in 2008 by Gustav.

"That really put a face on what the future was going to be like," said Jeff Williams, director of climate consulting for Entergy. "Clearly we are facing risks from sea level rise, more intense storms, floods, and surge damage." The company has looked at "hardening" key assets including power plants, substations, and transmission lines; it is beginning with investments designed to make Entergy "more resilient in ways that minimize business interruption loss," Williams says. The National Oceanic and Atmospheric Administration has estimated that 30 percent of US GDP depends on the Gulf region, mostly because it is a hub of the domestic oil and gas industry.

As an example, Entergy has begun a five-year, $73.5 million project to relocate and harden transmission and distribution lines serving Port Fourchon, La., which is the single largest point of entry for crude oil coming into the United States, handling about 13 percent of national imports. After Katrina damaged the electrical infrastructure, 25 percent of oil production and 44 percent of natural gas production became shut in, Entergy says. National oil prices went from $60 per barrel before Katrina to $70 per barrel after Katrina because of supply interruption; national natural gas prices went from $8 per thousand cubic feet (Mcf) to $15 per Mcf.

Smaller businesses are acting, too. The McMcIlhenny Co., which makes Tabasco Sauce and was founded in 1868 on coastal Avery Island, La., has made its factory and visitor center more resilient to better absorb future storms.

Agriculture is another industry that will be reshaped by a warming world, with some regions and crops doing better, thanks to a longer growing season and higher levels of CO_2 in the air, and other suffering. Seed companies have renewed their efforts to develop drought-resistant crops, said John Soper, director of product development at Pioneer Hi-Bred, a unit of DuPont. "We're expecting some drier weather to move into the key corn growing areas," he said. "The climate in Illinois might be more like the climate in Arkansas."

Pioneer is testing drought-resistant corn and other crops in desert-like test fields in California and Chile, he said, in part because farmers who now irrigate their fields are already telling Pioneer that they expect limits on the availability of water. In India, Pioneer is working to develop drought-tolerant varieties of rice, which is now grown on flooded land but may have to adapt to a drier climate. Other seed companies including Monsanto, Syngenta, and Bayer Crop Science are working on their own drought-resistant crops.

The insurance industry, meanwhile, has been declining to write property coverage along the Atlantic Coast, in part because of fears that stronger hurricanes will do more wind damage. (Citizens Insurance of Florida, a non-profit, state-run company that takes on property owners who can't get private coverage, has become Florida's biggest insurer.) Even the oil and gas industry–which, of course, is a major contributor to climate change–is paying heed. Several years ago, IBM, along with UK consulting firm Acclimatise and the Carbon Disclosure Project, published a report called Building Business Resilience to Inevitable Climate Change [PDF] urging oil-and gas companies to review their strategies, business models, and supply chains to "check their resilience to the new risk landscape created by inevitable climate change."

Environmental groups, which once focused solely on curbing carbon pollution, are now looking at adaptation, in part to underscore the urgency of the climate threat. Theo Spencer, a senior advocate at the Natural Resources Defense Council, which has been meeting with utilities, insurance companies, and others to talk about climate preparedness, says more companies are coming to understand that "the weather is changing, and we really need to do something about it." He quotes the White House science advisor John Holdren, who said the task ahead is not just "avoiding the unmanageable" but also "managing the unavoidable." Unavoidable climate change, and its consequences, are likely to be a corporate worry for years to come.

THE GREENBIZ INDEX

This fifth annual edition of the GreenBiz Index tells a story about how US companies are doing in 20 aspects of environmental performance—from operational efficiency to employee commuting to investments in clean technologies. At best, it's a mixed story, one far more sobering than we would have hoped.

For the first time, we saw a significant decline in progress—not just in one indicator, but several. Cleantech investments, energy efficiency, green office space, packaging intensity, toxic emissions, and toxics in manufacturing—all of these trend lines leveled off or reversed course in 2011. Only one indicator—green power use—markedly improved.

What's to blame? Simply put, sustainable business is suffering a recessionary hangover.

For much of the past few years, many of our indicators moved in positive directions. Combined with the commitments we were seeing, as well as our surveys of sustainability leaders in large corporations—which told us that their budgets, staff, and goals were holding steady or growing during the recession—we concluded that the economic turmoil, at least in the United States, wasn't putting a damper on companies' efforts to improve their environmental performance. The results could be seen each year in the continued progress measured by the GreenBiz Index.

We were, shall we say, irrationally exuberant.

The reality is this: Much of the progress we saw in our 2010 and 2011 reports were lagging indicators based on work done with pre-recessionary budgets. As the economic realities have set in, environmental progress has stagnated, or worse.

That's not the full story. Despite our efforts to normalize many of the indicators to Gross Domestic Product in order to avoid spikes and drops resulting from economic booms and busts, we believe that less economic activity doesn't always lead to lower environmental impacts. In some instances—electricity power plants, for example—industrial operations must operate at baseline levels that don't always move in lockstep with the economy.

There is, to be sure, some cognitive dissonance. We continue to see growing corporate sustainability commitments to reducing climate emissions, increasing energy efficiency, eliminating toxic ingredients, and reducing waste. We report on these every business day on GreenBiz.com.

Many of these commitments are long-term ones, suggesting that we'll see renewed progress in the coming years, especially as the economy rebounds. We continue to be optimistic, though perhaps more cautiously than in the past.

As in past reports, we've summarized each data set using one of three icons, stating whether we believe companies are making progress ("swimming"), standing still ("treading"), or falling behind ("sinking").

SWIM TREAD SINK

THE GREENBIZ INDEX: SUMMARY

Indicator	What We Measured	What We Found	Swim Tread Sink
Carbon Intensity	Emissions of energy-related carbon dioxide per unit of GDP	Emissions growing faster than the economy	
Carbon Transparency	S&P 500 companies responding to Carbon Disclosure Project	US response rates dip for the first time	
Cleantech Investments	Venture capital investments in clean technology	Cleantech takes a mild hit from a weak economy	
Clean-Energy Patents	Patents issued by US Patent Office	Innovation continues to make leaps and bounds	
Corporate Reporting	Number of reports from S&P 500 companies	Disclosure grows slowly while investor interest rises	
Employee Commuting	Number of workers driving solo, carpooling or using mass transit	Commuters can't shake the driving habit	
Employee Telecommuting	Number of US telecommuter households	Remote worker ranks creep up, with corporate support	
Energy Efficiency	Energy use per unit of GDP	Wasted energy grows as investments wane	
Environmental Financial Impacts	Environmental damage costs as a percentage of economic output	Companies get slightly smarter about managing eco-costs	
E-Waste	Percentage of recovered equipment	Hints of progress, but still dumping too much toxic trash	

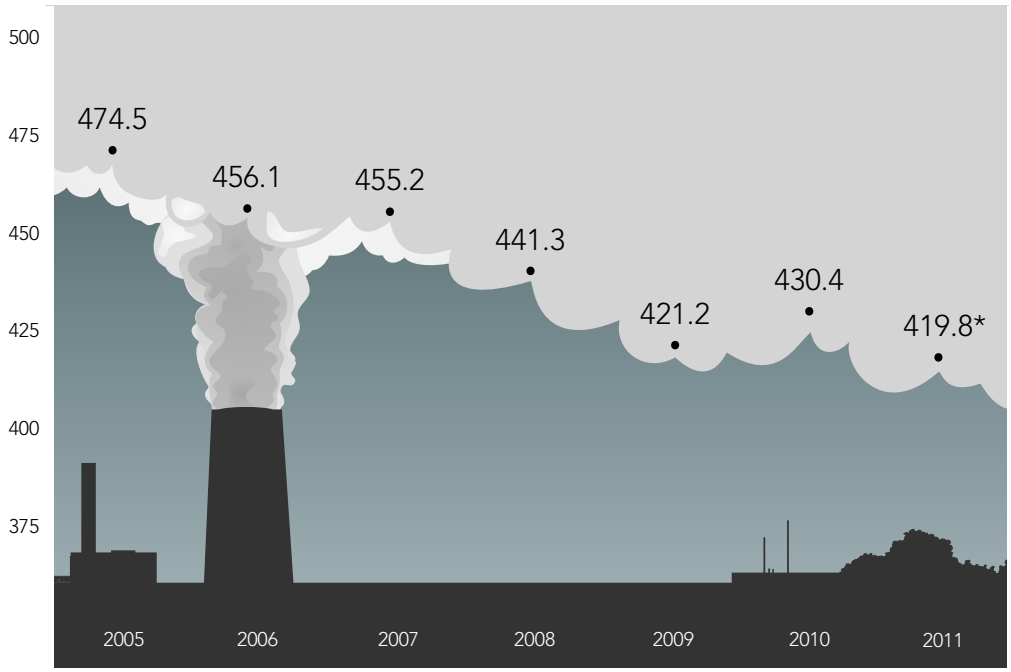
SWIM TREAD SINK

Indicator	What We Measured	What We Found	Swim Tread Sink
Fleet Impacts	Estimated annual greenhouse gas emissions per vehicle	Emissions creep up but fleets are shrinking	
Green IT	Products certified under Energy Star and EPEAT	Companies still enthusiastically plugging in to green certifications	
Green Office Space	LEED-certified commercial building space	A slow-down in LEED registrations could spell trouble	
Green Power Use	Renewable energy as a percentage of all electricity generation	Explosive growth, but still less than 5 percent of US energy	
Organic Agriculture	Sales of organic food in the US	Organic continues its small growth	
Packaging Intensity	Materials used per unit of GDP	Lightweighting hits the wall, progress stalls	
Paper Use and Recycling	Paper use and recycling per unit of GDP	Paper use climbs for the first time since 2004	
Toxic Emissions	Toxic releases per unit of GDP	A huge spike after some years of positive decline	
Toxics in Manufacturing	Emissions per year of 27 bioaccumulative and toxic chemicals	An 80 percent increase after years of minimal, but steady, decline	
Transparency	How much data companies disclose on environmental impacts	Radical transparency still a pipe dream as disclo-sure rates stay flat	

CARBON INTENSITY

WE'RE MOVING THE NEEDLE ... BACKWARDS

Million tons of energy-related CO_2 per million dollars of GDP*



Source: US Energy Information Administration
*Early estimate; number is likely to increase once final data for the year is in.

What We Found: The economy is growing, but not as quickly as carbon emissions, making the global economy more carbon intensive, not less.

What We Measured: Carbon intensity—a measure of energy-related CO_2 emissions per dollar of gross domestic product—increased 2.2 percent from 2009 to 2010, the most recent data.

Globally, carbon emissions rose 5.8 percent while the economy grew 5.1 percent in 2010, pushing growth of carbon emissions past economic growth for the first time since people started measuring such things. In the United States, energy-related CO_2 emissions rose 4 percent in 2010 after declining for several years. Early estimates for 2011 show a slight stabilization, with emissions from increased natural gas activity offset by the decommissioning of coal-fired power plants. Don't cheer quite yet, however: The Energy Information Administration estimates only a 0.7 percent decrease in emissions between 2010 and 2011.

Why It Matters: If the United States isn't able to grow its economy without increasing carbon intensity, then stopping global warming at 2 degrees per year—which scientists say would require a drop in emissions of 25 percent below 1990 levels by 2020—is an unreachable goal. This metric helps us focus on whether we're making meaningful energy-efficiency and renewable-energy efforts, regardless of economic conditions.

*All GDP data in this report are from the US Department of Commerce's Bureau of Economic Analysis and are stated in 2005 chained dollars.

What We're Seeing: The Pricewaterhouse-Coopers Low Carbon Economy Index, released in November 2011, cited several factors contributing to the global rise in carbon intensity in 2010: the rapid growth of emerging economies, including China, Brazil and Korea, fueled by high-carbon energy sources; colder winters (and a resulting increase in heating demand); the fall in the price of coal relative to gas; and a drop in renewable energy deployment.

"The results are the starkest yet," said Leo Johnson, a partner in the sustainability and climate change practice at PwC. "For the first time we have made no improvement in our rate of decarbonization. We have in fact increased the carbon intensity of growth. The economic recovery, where it has occurred, has been dirty."

Although early numbers for 2011 show a slight decrease in carbon intensity—due to an increase in renewable energy projects, decommissioning of coal-fired power plants, and more economic downturns—the final number is still likely to be higher than in 2009. Overall, it's a bleak picture. The 2011 PwC Low Carbon Economy Index shows that the G20 economies have moved from travelling too slowly in the right direction, to travelling in the wrong direction.

There are a few bits of optimism, however. Historically low prices for photovoltaic panels have enabled numerous large-scale solar projects to move forward. As we found in tracking Green Power Usage this year (see page 64), as of third quarter 2011, there's more than 1 gigawatt of installed solar capacity; the total in 2010 was just 887 megawatts. Companies also seem to be more committed than ever to tracking and reducing emissions, as we discovered when looking at the Corporate Reporting indicator (see page 38).

What's Next: The future largely depends on two key drivers: the ability and desire of governments to commit to emissions reductions, and the scaling up of renewable energy technologies:

- **Climate summits** in 2012 could finally lead to binding global emissions targets, if the United States, China, and India can be convinced to act sooner than 2015, the date these Big Three emitters have been pushing for. At the 2011 COP Summit in Durban, South Africa, negotiators hoped a legally binding treaty would be set forth; instead, the United States suggested setting 2015 as the target date for a treaty, which would push implementation off to 2020. For African and European Union countries, a delay of that magnitude is unacceptable. Negotiators from those countries will be pushing against that deadline in an attempt to spur quicker action in the years ahead, particularly when they can come to the table armed with the Intergovernmental Panel on Climate Change Fifth Assessment Report, *Climate Change 2013: The Physical Science Basis*, which comes out toward the end of the year and is expected to make more strongly than ever the case for urgent action on anthropogenic climate change..

- **Low polysilicon prices** will continue to drive solar projects in 2012, as module prices remain low. As large-scale solar projects come online, the price of solar will drop even further, which will in turn spur more large-scale deployments. In the United States, pending cuts to incentive programs are also likely to spur more activity in the short-term as developers rush to cash in on incentives before they expire. In the long-term, the loss of those incentives will slow renewable energy deployment, particularly for wind.

For the first time we have made no improvement in our rate of decarbonization. We have in fact increased the carbon intensity of growth.

CARBON'S RISING COSTS, AND RISKS

By Jigar Shah, CEO, Carbon War Room

Renewable Energy. According to the REN21 global status report for renewables, renewable electricity deployments are accelerating. They now represent more than 50 percent of incremental new capacity additions in 2010. However, we face an inevitable "catch-up" in emissions as the economy picks up speed again, so the bottom line is that we are headed in the right direction with renewable energy development, just not nearly fast enough due to inertia in the system from existing coal, oil, and gas infrastructure.

There is no silver lining in the latest carbon intensity news, but it is true that wind and solar have about a two-year energy payback. This means that while their deployment is accelerating, it takes more coal and natural gas electricity to make these technologies until growth rates come down. We have the potential to reach 100 percent of incremental energy coming from renewable electricity within this decade. Once we reach that point, growth rates can stabilize.

Cost of Carbon. The business risks associated with climate change are increasing rapidly. Carbon emissions are one risk, but carbon intensity is also a proxy for dependency on volatile fossil fuels, rare earth materials, water, and other supply chain risks. The rise in emissions will incur a cost for business, either in the shortterm or longterm, given that countries are moving toward international commitments to reduce emissions for all countries. A further cost will arise from the need of companies to contribute to the cost of adapting to a changing climate, given that the increase in emissions will lead to a warmer world.

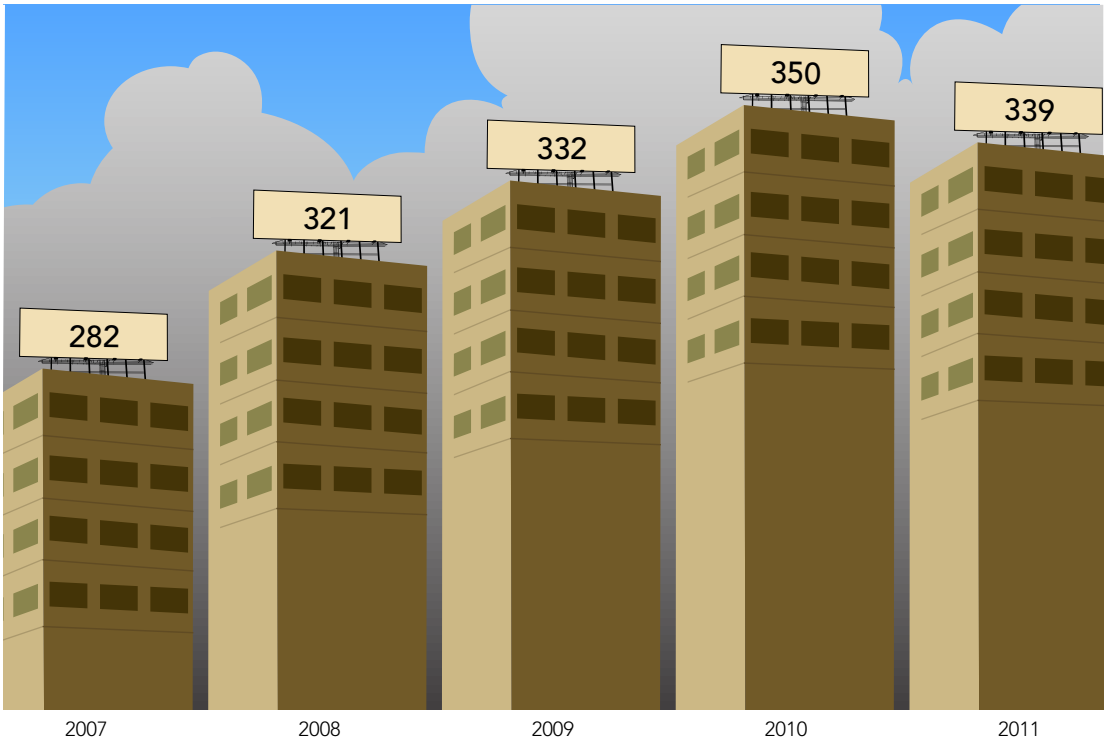
Regulation. Hopefully, governments are seeing that we simply cannot delay any further. Climate change solutions represent the largest, most dependable source of GDP growth in this decade. Governments need to act more swiftly to align their economies with the only sustainable growth opportunities available to them.

Founded by Sir Richard Branson, the Carbon War Room is a nonprofit that aims to harness the power of entrepreneurs to implement market-driven solutions to climate change. Shah has been at the leading edge of renewable energy development since founding the first solar-as-service company, SunEdison, in 2003.

CARBON TRANSPARENCY

QUALITY RISES, BUT NOT QUANTITY

Number of S&P 500 companies responding to Carbon Disclosure Project



Source: Carbon Disclosure Project

What We Found: Despite the fact that 2011 saw the number of S&P 500 companies disclosing their carbon footprints decline for the first time since 2006, other evidence suggests that carbon footprinting has become more robust and more common among large companies.

What We Measured: The number of S&P 500 companies responding to the Carbon Disclosure Project dropped 3 percent this year—the first decrease in reporting since 2006. However, among companies that did report, scores for quality of reporting continued to improve.

Why It Matters: Carbon disclosure and transparency is a proxy for good corporate governance, and it gives investors and stakeholders an idea of how well companies are preparing for climate change-related risks and business opportunities. Carbon accounting and reporting are the first steps of the carbon management journey, typically followed by setting goals and action, both of which key ingredients needed to move the needle forward on addressing climate change.

What We're Seeing: After years of increasing carbon disclosure, the number of companies responding to the CDP's annual questionnaire dipped for the first time. This can largely be explained by the churn rate of the S&P 500, an index whose makeup is constantly changing as companies are added and dropped based on their market capitalization. Other factors at play: companies abandoning voluntary disclosure as they get swept into the EPA's mandatory

reporting program and half-hearted disclosers leaving the game when the chances for federal climate change legislation evaporated. "We think it's a blip, not a trend," CDP CEO Paul Simpson said.

The news isn't all bad. Those that do report are getting better at it and becoming big believers in its business value. Board-level oversight of climate change issues has surged, and the percentage of companies incorporating climate change into their business strategies topped 65 percent in 2011, compared to 35 percent in 2010. The quality of their reporting continues improving, although the quality gap between US and global firms persists—and actually widened—in 2011. Even the best of the best—the S&P 500 companies on the Carbon Disclosure Leadership Index—have been unable to match the disclosure scores of their global peers.

Whether the decline in disclosure for S&P 500 companies speaks to a larger trend remains to be seen, but response rates are rising globally. US companies generally don't face the same regulatory pressures as their European counterparts, but are still subject to many of the same pressures to report their carbon emissions.

It all comes down to money. For one, 551 long-term, institutional investors—the kind big companies want to attract—are the driving force behind the CDP, and their ranks swell every year. The data will also grow in importance for other investment players, including equity analysts and rating agencies.

Market share is another powerful driver as companies find they must disclose just to keep customers ranging from Walmart to the federal government. Those information requests will continue rippling further up the supply chain.

"Every company needs to understand that this is just a part of doing business," said Darrel Stickler, corporate social responsibility manager for Cisco, which has performed well on the Carbon Disclosure Leadership Index for four years. "It's almost like doing a financial statement."

And just like financial information, carbon data will move into the realm of chief financial officers, predicts Chris Walker of Ernst & Young. And, like financial information, demand will grow for the data to be verified by a third party, beginning with the CDP, which now assigns more weight to verification when calculating disclosure scores. But with fewer S&P 500 companies making the effort, it's unclear what it will take to reverse this trend.

What's Next: Expect more companies to report their Scope 3 emissions, those produced outside their operations, including employee commuting, transportation, the use phase of products sold, and business travel. These emissions have always been a struggle to count, but companies now have for the first time a common framework: the Greenhouse Gas Protocol's recently released Value Chain standard. Ultimately, we see this development as one that will bring even greater scrutiny to supply chains as companies identify hot spots for exposure to climate-related risks and disruption.

Until there is federal climate change legislation, we will continue to see a division in the market between leading companies, which are both disclosing and reducing their carbon footprints, and the laggards, a smaller group of firms that doesn't view climate change as a material issue for their companies.

Demand will grow for the data to be verified by a third party, beginning with the CDP, which now assigns more weight to verification when calculating disclosure scores.

WHAT'S NEXT FOR CARBON REPORTING?

By Paul Simpson, CEO, Carbon Disclosure Project

Growing pressure. Measuring, verifying, and communicating carbon footprints will become more prominent in 2012 and beyond—by investors, businesses, and governments but also consumers. The rapid rate at which the citizen-led Occupy movement spread across continents demonstrates a growing distrust of the global economy and the businesses and institutions within the system. As a result of this widening chasm between citizens and the businesses, as well as the public's growing concern and awareness of climate change, low-carbon or carbon-neutral claims are likely to come under greater levels of scrutiny.

Investors, including the 550 that we work with, want to understand the implications of these pressures on their portfolios. Couple this with established correlations between effective carbon management and above-average financial returns by companies in the Global 500 equity index and we predict investors will pay closer attention to emissions reporting.

Grasping the full scope. The number of companies that report their Scope 3 emissions (those outside their direct operations) will continue to increase in 2012 as climate change forces global businesses to confront risk across their supply chains and reduce the impact of their products. Floods in Thailand last year wiped $450 million of profit from the Japanese automotive industry as a result of the interruption to Thailand-based suppliers. Already this year, beverage companies are paying close attention to the unusual weather in Florida that threatens the orange crops used to make juice that retails around the world.

New standards launched by the Greenhouse Gas (GHG) Protocol will enable businesses to better understand and manage the climate impacts beyond their own operations and improve efficiency across the value chain. They will provide a standard framework for reporting Scope 3 emissions and facilitate companies to heighten their understanding of climate change risk to their business.

This is another trend that will be mirrored by investors over time. To "identify potential mitigation opportunities, as well as to inform its appreciation of business risk associated with a carbon constrained future," the International Finance Corporation, part of the World Bank, has started measuring the GHG emissions of its direct investments.

An evolution in carbon reporting. The companies that report through the CDP are well positioned to respond to an increase in the number of countries adopting mandatory climate change reporting policy at national, regional, state and city level. California's revised mandatory GHG reporting regulation came into effect on January 1, 2012, while the UK Government is expected to kick-start the year with an announcement this month detailing whether or not mandatory reporting will be introduced. To prepare for and meet mandatory requirements, but also to aid stakeholder trust, verification of emissions data will increasingly become the norm.

We expect corporate reporting will also evolve to adopt a stronger focus on company strategy. Since climate change is increasingly becoming material to future business success, we expect it to be a key topics to accelerate the shift towards integrated reporting.

CLEANTECH INVESTMENTS

EVs KEEP VCs ON THE MOVE

Venture capital investments in clean technology, in millions

Source: Ernst & Young, based on Dow Jones VentureSource

What We Found: Venture capital investments in clean technology moderated during 2011, essentially reaching the same level as in 2010.

What We Measured: Venture capital investments in clean-technology firms. For the past decade, VCs have been the leading funders of cleantech startups, which—as measured by Dow Jones VentureSource and analyzed by Ernst & Young—include alternative fuels, energy efficiency, energy storage, energy and electricity generation, environmental services, industry-focused products and services, and water.

Why It Matters: Clean technology has long been seen as a major force—not just for building the so-called "green economy," but for building the economy overall. Many of the leading cleantech companies have gotten their start from venture capital investments, so VCs are a leading indicator of future technology development as well as of confidence in clean technology overall.

What We're Seeing: With the exception of 2009, when the global recession hit hard, VC investments in cleantech have grown every year. That changed in 2011, when there was a slight downturn, according to Dow Jones data.

Last year was a tumultous one for cleantech. Aside from the challenges of surviving in an unforgiving global economy, the politics of clean energy took an unfavorable turn. Clean energy had never received overwhelming political support—especially in the United States, where incumbent fuels have strong and powerful lobbyists—but what support it had dropped in the face of the bankruptcy of Solyndra, a solar startup heavily backed by government loan guarantees. Suddenly, solar—and, by extension, cleantech—was under a cloud of suspicion, seen as a risky investment unworthy of taxpayer support.

Solyndra wasn't the death knell for clean energy, but its demise had a sobering effect. Amid speculation about a bursting cleantech "bubble," investors pulled back. Initial public offerings plummeted during 2011, far more than the 33 percent drop in venture investment.

But that doesn't tell the entire story. The nature of investment shifted in a way typical of maturing technologies. In recent years, investment was roughly split between early-stage companies—those just starting up or undergoing initial product development—and those generating revenue and needing to scale up. During 2011, things tilted heavily away from startups in favor of later-stage companies, which received two-thirds of VC investments during the year.

And for all the tumult over Solyndra, solar continued to attract capital, garnering 80 percent of all energy and electricity generation investments, leaving all the other technologies—gasification, geothermal, hydroelectric, hydrogen, tidal/wave, and wind—to compete for the rest.

"What you're seeing is a maturing industry," says Jay Spencer, Ernst & Young LLP's Americas Cleantech Director. "You're seeing products coming to market. You're seeing products out in the field being used. As things are being used, like electric vehicles, people are starting to think about other business models that can be developed. It's an extremely exciting time to be involved in cleantech."

As solar and other clean technologies—biofuels, efficiency, electric vehicles—start to reach commercialization, VCs become less relevant and investments shift to large corporations—as potential buyers of the technologies—or investment banks, pension funds, and other institutional investors—which invest in large-scale projects such as solar and wind farms.

"Corporations have woken up and are paying very close attention," says Sheeraz Haji, CEO of Cleantech Group, a research and advisory services company. He points out that it's not just the corporate venturing departments, but also some CEOs who see cleantech as a strategic investment. He cited GE CEO Jeffrey Immelt and NRG CEO David Crane as two who are leading their companies' charge to invest in clean technologies. "It goes to the heart of what aggressive, talented CEOs want to do," he says.

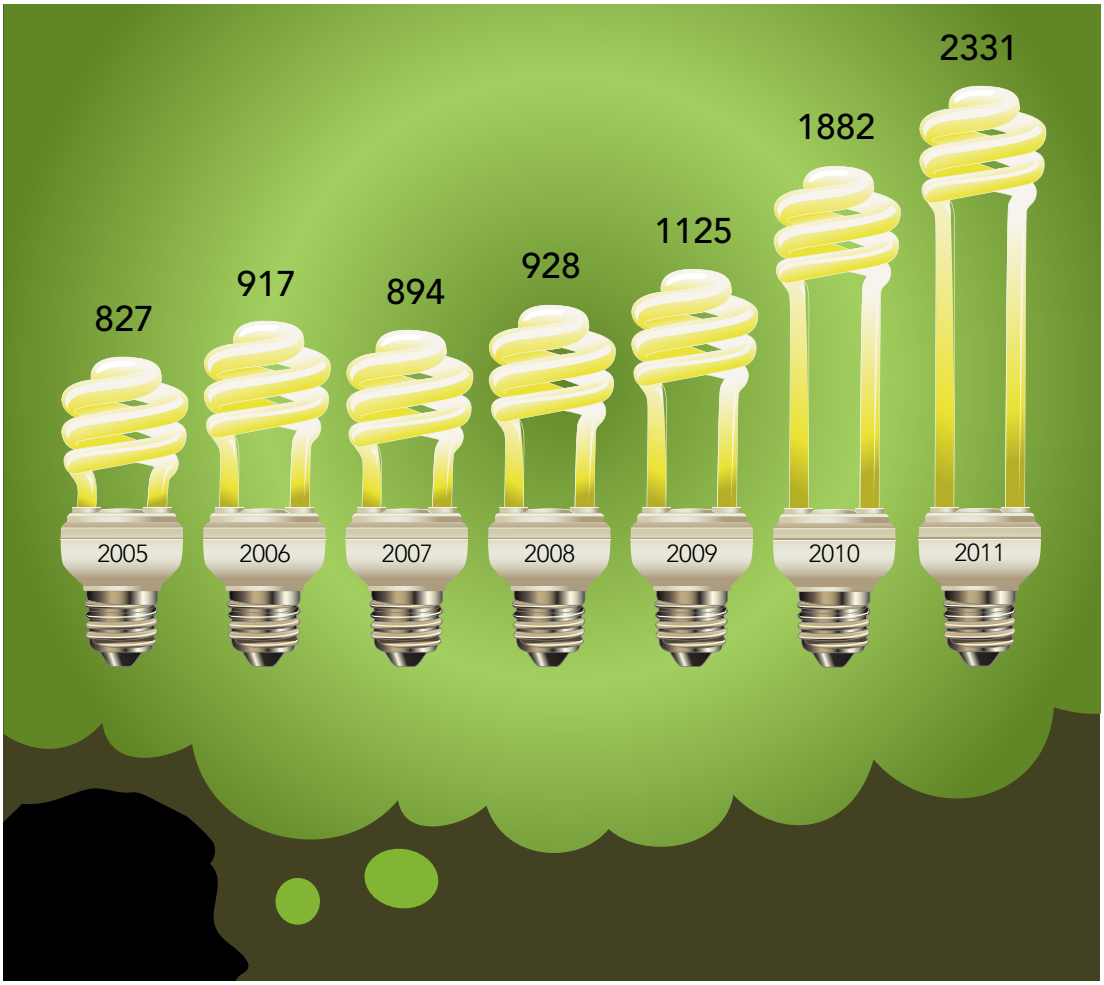
What to Expect: Cleantech isn't going away, political winds notwithstanding. But it's unclear what role venture capitalists will play going forward. In the present economy, VCs are struggling to raise new cleantech funds, meaning their lifeblood will be constrained going forward. But there are still technologies in need of development—battery storage, for example, and next-gen electric vehicles, not to mention many aspects of the so-called "smart grid." Expect investments to bouce back in 2012, as politics fades and investors and entrepreneurs get back to the business of inventing a cleaner future.

For all the tumult over Solyndra, solar companies continued to attract capital, garnering 80 percent of all energy and electricity generation investments.

CLEAN-ENERGY PATENTS

INNOVATION IS ON A FORWARD MARCH

Number of patents filed with the US Patent and Trademark Office



Source: Heslin Rothenberg Farley Mesiti P.C.

What We Found: Clean-energy patents jumped again in 2011, growing 24 percent over 2010's record high. That continues the steady growth we have seen for the past decade, but especially the past three years. Between 2008 and 2011, clean-energy patent filings have grown more than 250 percent.

What We Measured: Clean-energy patent applications filed with the United States Patent & Trademark Office, as compiled by the law firm Heslin Rothenberg Farley Mesiti P.C.

Why It Matters: Patent filings are a leading indicator of technology development. While not all patents turn into inventions, let alone into commercial products—and even those that do can take years to get from the drawing board to the marketplace—patent filings show where there is potential for innovations, efficiencies, and advancements.

What We're Seeing: Over the past decade, patents for a wide range of clean-energy technologies have been on a relentless march upward, growing nearly every year. And in the two years where patent filings dropped, they were small downturns, with growth resuming the following

year. That's a remarkable and consistent technology success story.

The patents were across the full spectrum of energy technologies, as well as hybrid and electric vehicles. Within those technologies are some interesting story lines.

Take solar, for example. Many now view solar as a "mature" technology; indeed the Solyndra narrative, including by us, is that its demise is a natural part of the evolution of technological cycles, and that as technologies mature, companies consolidate, and competition narrows. And yet the number of patent applications for solar-related technologies was one of several bright spots in 2011: solar patent filings jumped nearly 50 percent in 2011 over 2010, after more than doubling between 2009 and 2010. That strongly suggests that innovation in solar energy is still evolving, and that new, more efficient—and possibly disruptive—technologies are yet to come.

Wind patent filings were brisk, too, jumping more than 85 percent year over year. That's another technology commonly seen as mature. After all, how many more ways can you innovate on the basic windmill? Apparently, a lot.

What to Expect: We haven't yet seen the peak of the cleantech innovation trend. There are areas still ripe for change, notably battery storage, which shows up partially in the fuel cell data (which dipped slightly in 2011), though it doesn't reflect the fast pace of innovation coming to conventional lithium-ion batteries used in consumer electronics and some electric vehicles, as well as new battery technologies being developed. Electric vehicles, meanwhile, are just now in their infancy, a technology with lots of opportunities to improve.

We haven't yet seen the peak of the cleantech innovation trend.

And then there's the smart grid, a vast array of switches, sensors, software, and other things being harnessed to make energy-using devices smarter and easier to monitor and optimize, as well as to efficiently integrate clean-energy technologies into the existing grid. Patents for those technologies aren't reflected in our indicator. There's lots more yet to come.

CLEAN ENERGY PATENTS, BY TYPE

	Wind	Solar	Hybrid or Electric Vehicle	Fuel Cell	Hydro-electric	Tide or Wave	Geo-thermal	Biomass/ Biofuels	Other	**Total***
2002	42	162	144	349	6	9	2	12	9	**723**
2003	49	156	122	464	5	11	5	24	3	**824**
2004	72	124	98	551	8	18	8	16	4	**885**
2005	92	104	101	501	7	11	6	14	3	**827**
2006	109	95	105	572	8	18	5	13	5	**917**
2007	133	100	105	517	4	15	4	28	2	**894**
2008	155	95	86	530	10	34	9	19	9	**928**
2009	156	155	105	634	3	26	10	49	2	**1,125**
2010	245	363	168	996	19	40	6	63	17	**1,882**
2011	455	541	203	952	15	60	7	104	38	**2,331**

* Row totals may be less than the sum of the row because some patents fall into more than one category

Source: Heslin Rothenberg Farley Mesiti P.C.

THE FUTURE OF CLEAN-ENERGY INNOVATION

By Scott Elrod, VP and Director of the Hardware Systems Laboratory, PARC

While technologists like me imagine forests of quantum-nanowire photovoltaic (PV) panels powering the planet by 2050, the reality is that clean-energy innovation in the next 40 years may not be as sexy as you imagine.

Don't get me wrong. I believe the ability to envision new possibilities is needed to move science forward. Some of the most elegant innovations that have come out of research labs—Stanford's photon-enhanced thermionic emission, Berkeley's hot-electron PV device—inspire wonder. But the more realistic and likely path for cleantech will be through steady improvements to existing technologies: innovations as opposed to inventions.

Here's why: Technology adoption doesn't happen in a vacuum. There are broader social, cultural, political, and especially economic contexts that influence things. There are powerful incumbent technologies, like coal-fired power plants and oil extraction and refining. These have large economies of scale: terawatt-level, far beyond the gigawatt scale of today's solar. So displacing today's carbon economy is easier said than done.

While many have already dissected what went wrong with Solyndra, the company actually had one thing right: It recognized that the only way to compete with incumbents is to grow very big, very quickly. Unfortunately, Solyndra's CIGS approach was unproven and did not result in the necessary cost performance. Why? Because the process of optimizing novel semiconductor materials like Solyndra's is painstaking, a point made abundantly clear by the National Renewable Energy Laboratory's research into PV-cell efficiencies: There's no Moore's Law for PV, just a 4 percent improvement in conversion efficiency every 10 years.

So where do we get 10-20 terawatts of non-carbon-emitting energy by 2050—what UN climate scientsts say we'll need? Only the technologies that are reasonably mature today—silicon PV, solar thermal with steam turbines, demand management—have a chance of mitigating climate change. PV alone could supply global electricity needs if annual production of silicon panels grew 30 percent a year until 2030

While less sexy than thin-film approaches, silicon PV technology will win in much the same way silicon CMOS technology wins in microelectronics: despite many competitors, none have succeeded. So expect significant innovations in the coming years, ranging from novel manufacturing and solar cell printing approaches like PARC's—which allow PV deployment to be self-sustaining without subsidy in less than 10 years—to demand-side reduction strategies (LED lighting, efficient cars and appliances, smart systems) that can be implemented very quickly to cut energy use.

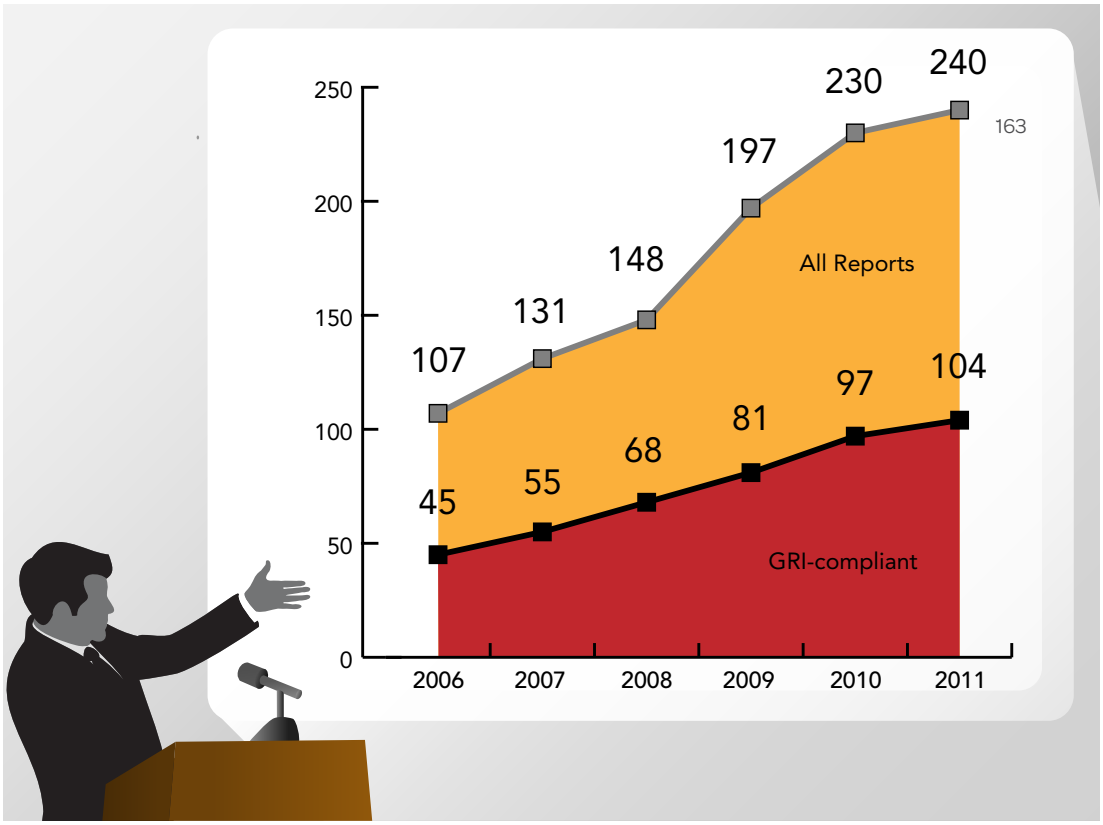
Alan Kay, a computer scientist at PARC, famously said, "The best way to predict the future is to invent it." When applied to cleantech—where the future hinges on deploying solutions at a massive scale—I say the best way to predict the future is to innovate it.

Elrod directs the Cleantech Innovation Program at PARC, which focuses on energy efficiency, clean water, renewable fuels, and more.

CORPORATE REPORTING

INVESTORS SAY, 'INFORMATION, PLEASE'

Number of reports filed by S&P 500 companies



Source: CorporateRegister.com

What We Found: Forty-eight percent of S&P 500 Companies now report non-financial environmental and social performance indicators, up 4 percent from 2010.

What We Measured: Data from the UK-based CorporateRegister.com, which maintains the world's largest online directory of sustainability reports. Over the past 5 years, the number of reports has increased 125 percent.

Why It Matters: When companies track environmental and social impacts, they can gain a great deal of self-knowledge. They also can begin to set goals and targets for improving performance. Doing so aids investors and shareholders as they analyze the overall health of companies and assess the benefits and risks of investing in a particular company. Of course, they can benefit the companies themselves, too, by providing a road map for efficiency and other improvements.

What We're Seeing: Bloomberg, Thompson Reuters, and other financial data providers have moved to incorporate sustainability indicators into their databases, making corporate sustainability data available at investors' fingertips. The information contained in a company's corporate responsibility report is increasingly important to investor decision making and, as a result, to companies' boards and executives.

"Shareholders are changing the game," says Mike Wallace, US director of the Global Reporting Initiative (GRI), a global framework for corporate

responsibility reporting. "They feel emboldened by all the recent market turmoil and they are demanding more transparency."

Companies are keeping up with those demands. The KPMG International Survey of Corporate Responsibility Reporting 2011 found that 95 percent of Global Fortune 250 companies are reporting on corporate responsibility. Reporting increased 11 percent among the 100 largest companies in the 34 countries surveyed since the firm's last survey of reporting in 2008.

More importantly, the survey showed that over half of the reporting Global 250 companies said they gain financial value from their sustainability initiatives. Companies in the Dow Jones and Nasdaq sustainability indexes are required to issue sustainability reports and they are currently outperforming non-reporting companies.

Initiatives by governments, stock exchanges and the United Nations (through its Principles for Responsible Investment, or PRI) are driving the uptick in reporting, as well. In South Africa, for example, corporate reporting rose to a whopping 97 percent in 2011, up from 45 percent in 2008; KMPG attributes this dramatic increase to the country's King Corporate Governance Commission code. On the global scale, all 800 PRI signatories—which includes large international asset managers such as CalPERS, the AFL-CIO Reserve Fund, and the BBC Pension Trust, as well as investment managers such as Black Rock, JP Morgan, and T. Rowe Price—have said they want to see more disclosure, not just on carbon emissions, but on corporate environmental and social governance more broadly. Thirty-three of the world's stock exchanges now either require or strongly encourage listed companies to report on their management of environmental and social issues.

It's not all top-down efforts driving disclosure. "Procurement is probably going to end up being the biggest driver," Wallace says, pointing at companies like Puma, Microsoft, and Nestle that require suppliers to publish sustainability reports. "Suppliers want to comply because they want to keep the buyer happy, but also buyers can freely stop in and check things out—government officials and investors can't do that."

What's Next: With more global companies using the GRI indicators and framework to report, the next move is toward getting these reports verified by third-party auditors. Several of the largest accounting firms that audit company financial statements are beginning to train staff to audit sustainability reports. The Singapore stock exchange recently issued a preference for companies whose CSR reports were third-party verified, and GRI's Wallace expects to see more institutions showing this preference. Currently only 10 percent of US companies have their reports verified.

Key Players:

- **Puma** has joined with GRI-certified partners to train its suppliers to produce reports that align with its own. The plan now is to get all of the company's suppliers producing reports, and then ask them to have those reports verified by a third party.
- **Copenhagen Stock Exchange.** The Danish government is requiring that all listed companies either report on material environmental and social governance issues or explain why those issues are not material.
- **US General Services Administration.** The biggest buyer in the world is the US government, and it is looking to green its supply chain. Its impact remains to be seen, but the GSA has had procurement staff trained on the GRI indicators.

Companies in the Dow Jones and Nasdaq sustainability indexes are required to issue sustainability reports and they are currently outperforming non-reporting companies.

REPORTING: THE SEED FOR INNOVATION, GROWTH

By John Hickox, Americas leader for Climate Change & Sustainability, KPMG International

Corporate responsibility (CR) reporting was once seen as fulfilling a moral obligation to society. Now, many companies recognize that disclosing activities that benefit their employees, community, and the environment has become a business imperative. Organizations are increasingly demonstrating that reporting provides financial value, drives innovation, fosters efficiency, and promotes learning, all of which helps companies expand their business and increase value to stakeholders.

A recent KPMG study found 83 percent of the largest firms report their CR activities, up from 74 percent in 2008. There are several reasons for this growth. The top motivations included reputation and brand, employee motivation, innovation and learning, and risk management—all of which combine to provide greater impetus to make CR reporting part of an organization's overall business strategy. But nearly half of the companies reported increased financial value as a result of their CR reporting.

Although there is plenty of progress being made on sustainability reporting. There is plenty of progress being made on sustainability reporting. Here are

Integrated Reports. The rise of CR reporting raises the question of how companies should be providing this information to their stakeholders to receive the greatest benefits from its disclosure.

A few companies have combined their CR and financial reports into one annual report. While this is a valuable stepping-stone in building a holistic understanding of how CR impacts the business, companies will likely gain greater value once both sets of information are treated as part of the company's comprehensive performance reporting, both to internal management and external stakeholders. Ultimately, a combination of financial and CR reporting is a more comprehensive approach to reflecting a company's full performance in delivering on its strategy.

Data Assurance. As CR reporting becomes *de rigueur*, both external and internal stakeholders will be reviewing the reports with increasing scrutiny. That raises another issue: data quality. Because CR reporting is still a nascent field, each company seems to be slowly evolving its own information systems and processes.

In the long run, however, restatements, errors and omissions in CR reporting can begin to erode investor confidence in the data, but also in the quality of the organization's wider governance structure and internal controls. As a result, CR reporting systems must quickly reach a level equal to current financial reporting, including a comparable quality of governance, controls and management.

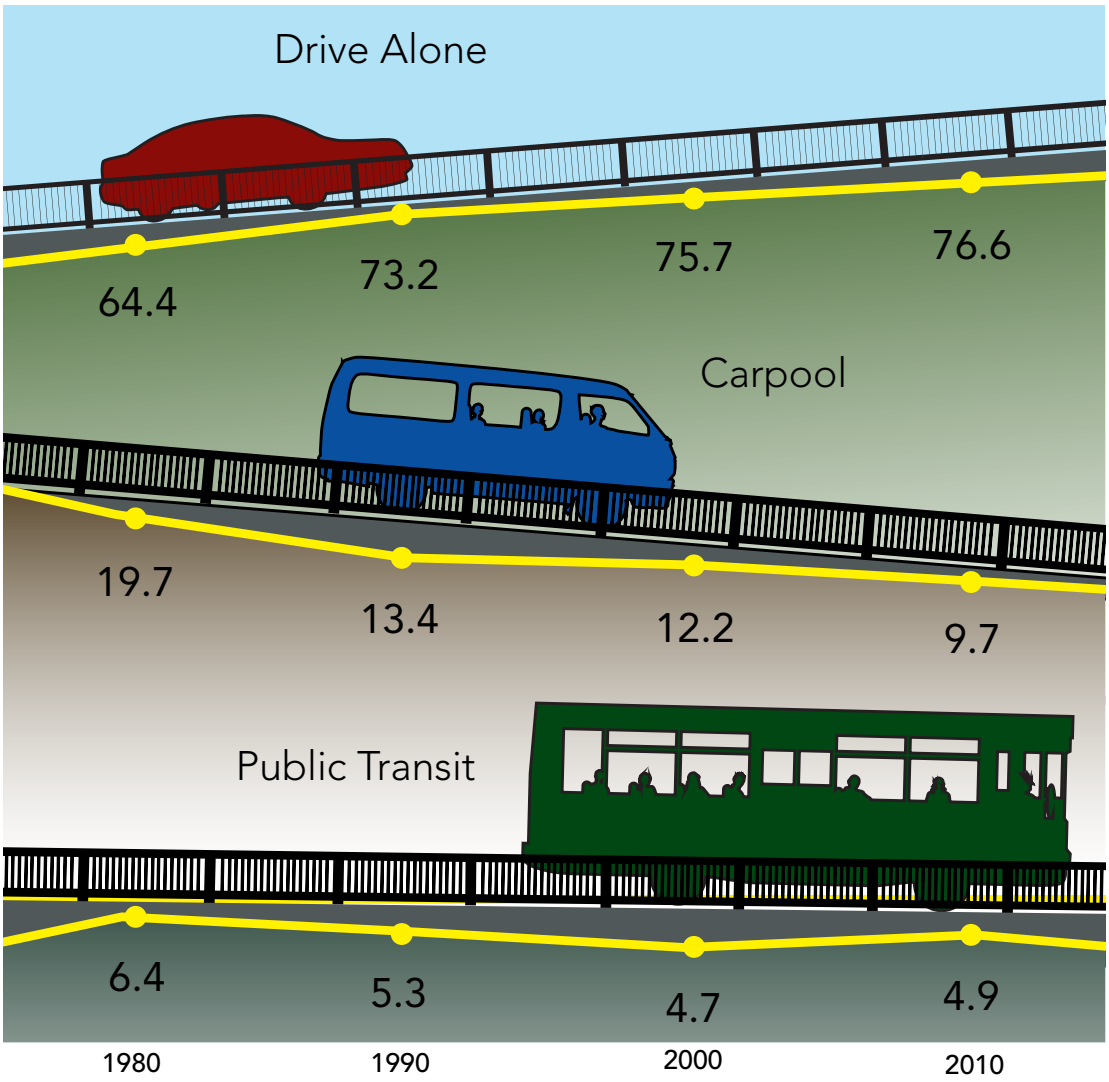
While external assurance results in enhanced credibility, companies can also gain internal benefits, as well. For example, assurance can provide opportunities to identify and drive process and performance improvements. And it can provide opportunities for organizations to sharpen their CR reporting to deliver more value to all interested parties.

CR reporting is now a requirement for any company hoping to be seen as a responsible corporate citizen. But the benefits go far beyond bolstering reputation: CR reporting can be an integral part of a business's strategy to innovate, grow, and gain market share.

EMPLOYEE COMMUTING

CARPOOLING TAKES A U-TURN

Mode of commuting, by percentage



Source: US Census Bureau and American Community Survey

What We Found: The American workforce hasn't shaken its love affair with driving just yet, but there are promising signs for the future.

What We Measured: A half percentage point increase in commuters driving, solo, to work, along with small dips in carpooling and public transit use, according to the US Census Bureau and American Community Survey.

Why It Matters: How employees get to and from work is an important but often-ignored factor in a company's overall environmental impact. But most commuters—about 105 million of them—drive, singly, most days. For a five-day-a-week habit with a car that gets 19 MGP, the average 24-mile roundtrip commute generates 8,000 pounds of CO_2 emitted each year. And while many commuters would love to defray the thousands they spend on gas and car maintenance (about $8,000 for an average family of four) each year, they generally consider the

alternatives—long bus or train rides; biking on poor roads—unappealing.

What We're Seeing: While the latest data from the US Census Bureau doesn't reveal any dramatic shift in commute preferences, it also gives a very wide-angle view. The survey asks commuters how they normally get to work, but it doesn't reveal that many people telecommute one or two days a week, says Phil Winters, director of the transportation demand management program at the University of South Florida's Center for Urban Transportation Research. Or that they ride their bikes from time to time. These "alternative" commuting methods might not dominate, but they're hidden from view in the stats.

The economy is also having an impact on preferences. "If you and I carpool together, but then I get laid off, that's two less carpoolers," he says. Similarly, employees who are concerned about job security in a tight job market may not be willing to gamble on a late bus or a sweaty bike ride if they're used to driving.

Still, things are changing. In Sweden, Volvo employees designed a smartphone application, called Commute Greener, that allows individuals to determine the carbon emissions related to their normal commutes, as well as test out alternative means of getting to work. Employees were able to reduce the carbon footprints of their commutes by as much as third within a month of using the tool. Mexico City used the app in a pilot program as part of its initiative to redice city-wide emissions. The pilot showed that individuals were able to reduce their commute-related emission by up to 40 percent.

Employers are also looking for ways to entice single drivers out of their cars through initiatives that increase transit options and encourage ridesharing and cycling—especially in suburban settings with few public transit options and expansive campuses. This can serve as a part of a larger initiative to lower the organization's overall emissions, as is the case at the National Renewable Energy Lab (see page 43).

Another hopeful sign is that during the first nine months of 2011, the American Public Transportation Association tracked a 2 percent increase in ridership on public buses and trains.

This trend may continue, even as the economy recovers: A study, commissioned by car-sharing service Zipcar, found that 55 percent of Millennials (18-34 year-olds) are actively trying to drive less, up from 45 percent in 2010. Millenials also indicated a preference for using a car-sharing service over private car ownership.

What It Would Take: More employers taking a proactive approach to encourage alternative commuting methods and to connect the dots between forms of commuting and good health. Also key is government support, such as tax benefits, that encourage public transit, carpooling and biking. Currently, cycle-commuters can earn $20 month in commuter checks, while drivers can earn up to $240 to cover parking fees. Bike advocates say that's not enough incentive to ditch cars.

What to Look For: While most US programs are still nascent, bike-sharing is emerging as a means to an end for commuters who find that public transit can get them close to their offices, but not close enough. Bike-share stations near transit hubs allow commuters to ride that last mile or two without trying to lug their own bikes—if they have one—onto a bus or train. And in a whole new twist on the concept of frequent-flyer rewards, a London startup called PleaseCycle has developed an application that lets employees track their bike-commuting miles in exchange for discounts on products or even days off.

Employers are looking for ways to entice single drivers out of their cars through initiatives that increase transit options and encourage ridesharing and cycling.

HOW NREL FOSTERS LOW-IMPACT COMMUTING

By Lissa Myers, Traffic/Transportation Project Manager, National Renewable Energy Laboratory

The US Department of Energy's National Renewable Energy Laboratory (NREL) is committed to advancing renewable energy—and not just in theory. NREL's Golden, Colo., campus, just west of Denver, is more than a decade ahead of the 2030 Department of Energy mission directive to produce a net-zero energy building, thanks to an ultra-efficient building design and the use of clean power, such as that collected from rooftop photovoltaic panels. The focus on energy conservation extends beyond buildings. NREL's employee commuting program has led to a 6 percent decrease in single-occupant vehicle commute trips, during a time when the facility's staff grew by 50 percent.

NREL's culture supports its employee-commuting initiative, and the program plays an important part in NREL's wider effort to reduce its greenhouse gas emissions to meet federal reporting goals. Plus, the program helps NREL, which employs 2,000 people in Golden, act as a good neighbor by reducing traffic and environmental impacts.

Altering the way people commute hasn't been easy. It's a big behavior change, even among the most green-minded employees. NREL's campus is located in a suburban environment surrounded by low-density residential development, minimal business development, and limited transit service. Before the program launched in 2008, there were few easy alternatives to driving to work.

To encourage staffers, NREL offers a buffet of options, including free public-transit passes and vouchers for vanpool services; a Web-based rideshare database; free shuttles across the campus and to nearby transit stations; bike paths, bike parking and showers for cycling employees; and flexible work practices ranging from compressed workweeks to regular telecommuting options.

NREL's commuting program is consistent with its mission and with federal mandates, but it is also a sound business practice. Executive management continues to support the program because it delivers results, including providing better quality of life, improved employee morale, and increased productivity.

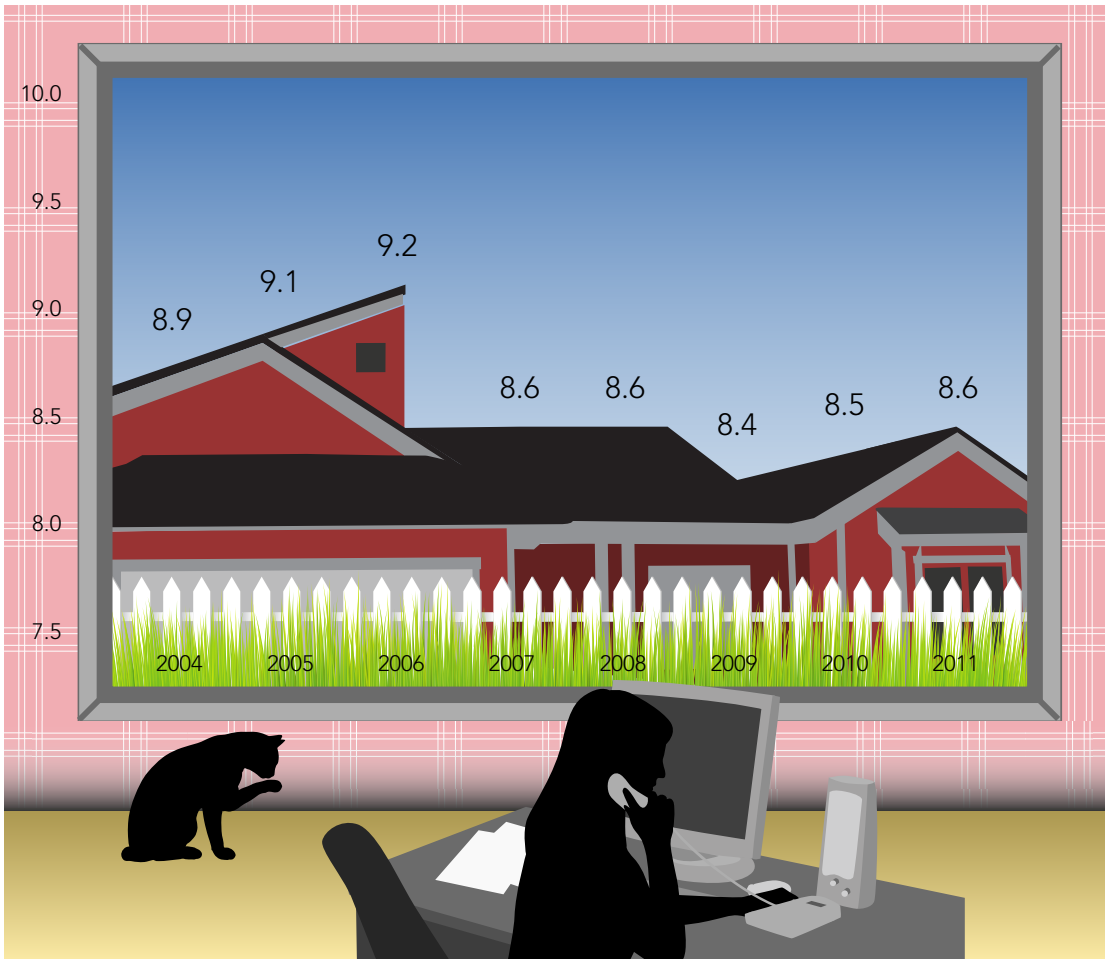
Despite ongoing logistical and geographic challenges, NREL continues to make progress on its commuting program. In the latest commuter survey, approximately 19 percent of NREL staff said they telecommute at least one day a week and another 24 percent reported telecommuting at least once a month. Telecommuting now represents about 4 percent of total commute trips, up from just 1 percent in 2007. NREL wants to improve on these stats, with a goal of having 32 percent of staff telecommute at least once a week.

It takes time. Growing our complex program has required champions at the highest level within NREL, convenient access to information about alternative commuting choices, staff training and guidance, as well as developing a top-down and bottom-up approach that includes individual attention and nurturing as employees adopt significant behavior changes.

EMPLOYEE TELECOMMUTING

MORE WORKING AT HOME, BY DESIGN OR CIRCUMSTANCE

Millions of telecommuter households



Source: IDC

What We Found: Telecommuting is gaining popularity with both companies and employees, and 2011 saw slight gains in the number of households where someone works from home at least three days a week.

What We Measured: There were 8.6 million telecommuter households at the end of 2011, up a tick from 8.5 million in 2010, according to IDC Research, based on its analysis of a survey it administers. IDC defines a telecommuter as someone who works from home at least three days per week.

Why It Matters: The conventional 9-to-5, commuter workforce has a major downside: clogged roadways. For more than 75 percent of working Americans, driving solo to and from work is the norm (see page 41). And there's the negative impact of business travel, which puts people in security lines and hotel lounges when they could be doing actual business. The energy we could save if US employees with telecommute-compatible jobs worked from home half the time equals almost half of the oil we import from the Persian Gulf, figures the Telework Research Network, a research and consultancy firm.

What We're Seeing: The cubicle is doomed, but just how long a plank it will walk is still unclear. After steady growth in telecommuting during the early 2000s, it petered out in the recession and workers started feeling insecure about their absence from the office. But the tide is turning, both among telecommuters and their current (and possible future) employers. Between now and 2016, the Telework Resource Network (TRN) estimates the number of regular telecommuters will grow by 69 percent.

"People are really bummed out and burned out as result of the recession," says Kate Lister, president of TRN. "At the beginning of the recession, they were glad to have a job. But now they have to do more with less. They're discontented. So employers are looking again at work-life quality issues." That means they're eager to offer telecommuting options to employees who prove themselves productive outside the office. And when it comes to hiring, offering flexibility and support for telework can be what wins over a favored candidate.

Obviously, no one could telecommute without some basic technology, such as a fast Internet connection and reliable phone service. But tech advances are also chipping away at the biggest hurdle for remote workers: the fact that they're not physically at work. Virtual conferencing tools can't totally replace every nuance of in-person meetings, but they're perfectly adequate for many types of collaboration and interaction.

Plus, telecommuting can be good for business. Researchers at Stanford teamed up with a Chinese travel agency to test the anecdotal evidence that employees who telecommute are more productive. It proved true. Operating at home, the group of 255 newbie telecommuters placed more calls, worked longer hours (thanks partly to no commute time) and took fewer sick days than their in-office colleagues. The upshot: improved sales and reduced turnover, thanks to more contented workers.

Moreover, the costs of IT resources needed to support telecommuting can be offset through lower real estate needs, lower energy consumption, and the ability to keep people working during disruptions, such as severe weather events. Employers are also increasingly interested in using telecommuting and flexible schedules as a means of reducing their organization's carbon footprint, as the National Renewable Energy Lab is doing (see page 43). If everyone in the United States who could telecommute did so regularly, TRN estimates the greenhouse gas impact would be equivalent to taking the entire New York State workforce off the road.

For telecommuting to really take off, employers need to stop equating productivity with arbitrary hours, so-called "face time" and the clamor of a crowded office, because distrust among middle managers is the biggest single hurdle to growing the ranks of telecommuters, says TRN. On the flip side, employees and job-hunters also need to prove themselves to be effective communicators who are able to meet or exceed work targets in order to gain employers' confidence.

Who's Making It Work: Plantronics, a maker of wireless handsets, recently redesigned its Santa Cruz, Calif., headquarters and included large monitors in meeting rooms, so employees can call in both audibly and visibly, using conferencing software. The office also includes small, private meeting rooms with monitors, for one-on-one virtual meetings. Plus, the office, which is big on meeting spaces and small on cubicles, is designed to accommodate only about 75 percent of employees, expecting the rest will be either traveling or telecommuting.

Cisco is taking a similar tack in how it redesigns its workspaces (see page 46). It helps reign in the emissions produced through business travel with its TelePresence platform. This tool goes beyond basic videoconferencing by creating virtual meeting spaces for small groups of people who can be located around the world.

Distrust among middle managers is the biggest single hurdle to growing the ranks of telecommuters, says the Telework Resource Network.

TELECOMMUTING FOR SUSTAINABILITY

By Gordon Feller, Director, Internet Business Solutions Group, Cisco

How do we reduce the environmental impact of, literally, going about our business? We start the way we always have: with infrastructure and the tools and technologies that support it. Ultimately, these are the things that shape our cities.

Research models suggest that within five years, a smart and connected city of 5 million can realize an estimated $15 billion growth in revenues, 9.5 percent GDP growth, and 30 percent in energy savings while creating approximately 375,000 new jobs. This revolution presents enormous potential to enhance workplace performance and support workplace mobility in many ways, including rethinking the office experience. The office won't disappear, but it will attain higher value at the nexus of social interchange and collaborative knowledge sharing. Look for design innovations that hybridize the norms of a conventional workspace into an experiential destination: user-centric, flexible, and dynamic.

Where collaboration goes to work. Suppose your company champions collaboration and teamwork, but then you find that, because of this collaboration and teamwork, two-thirds of the total assigned seats in your real estate portfolio are going unoccupied each day. That's what we found at Cisco, and it's why we decided to redesign how Cisco works.

With more than 63,000 employees in a global real estate portfolio of 21.5 million square feet, Cisco faced the same workforce and technology shifts as all organizations. Work styles were changing, but space allocation was static and underutilized. On a typical day in our San Jose, Calif., campus, an average of 67 percent of all assigned seats were empty. Observed occupancy studies showed that even badged-in employees spent far less time at their desks than they thought they did. The workspace simply no longer fit the nature of the work or the worker.

By allocating workspaces and developing tools to foster telecommuting, we were able to better utilize the campus and lower the percentage of empty assigned seats to 50 percent. Along the way, we created a template for workplace efficiency. Non-entitled and non-hierarchical, the spaces respond to group-level needs and actual workplace demand.

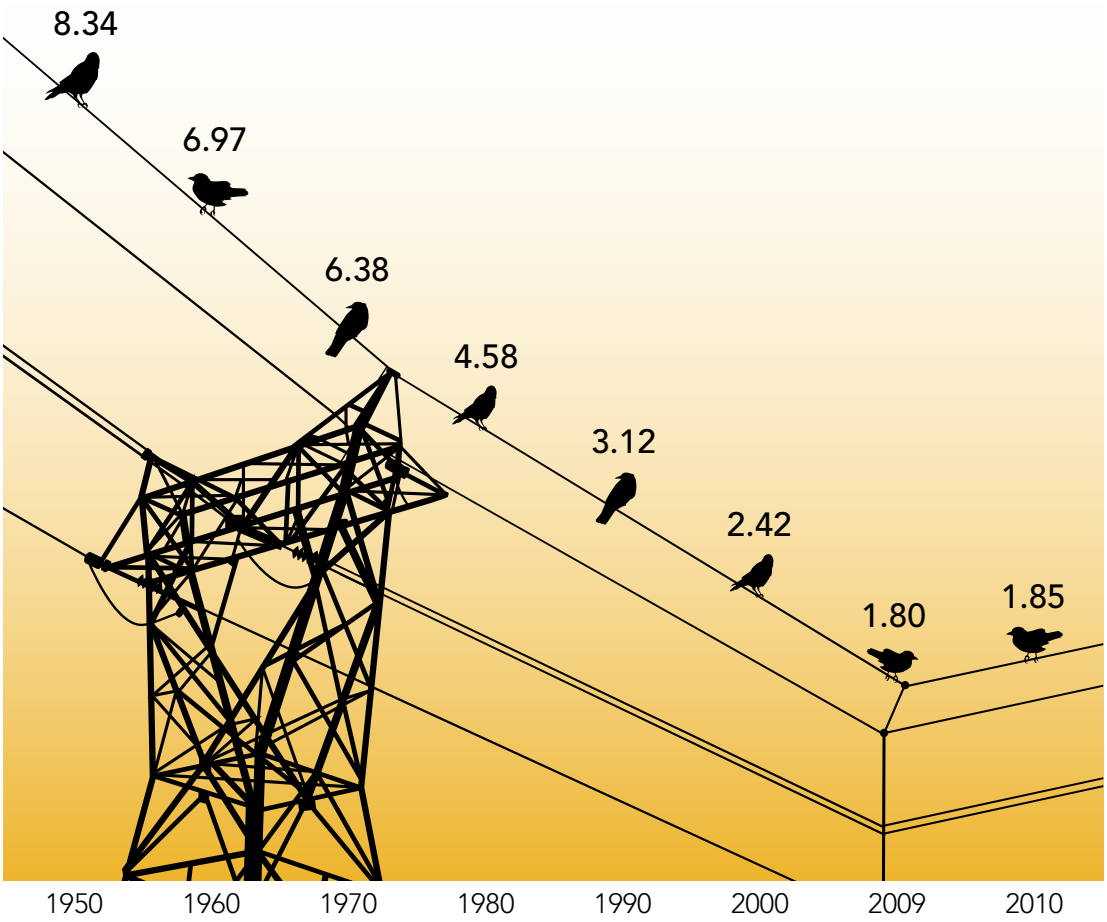
Amsterdam Smart Work Centers. What began as a mayoral initiative to reduce commuting grew within three years into a public-private network of more than 100 telepresence centers, virtual clusters of network and videoconferencing services that change the way work and collaboration is organized.

Amsterdam's vision evolved into a Cisco Smart+Connected Communities initiative, providing services for connected real estate, government services, utilities, transportation, and healthcare. Teaming with a large ecosystem of private and commercial partners, Amsterdam deployed a citywide network that forms a strong foundation for the delivery of smart services and fostering economic growth. A public telepresence service allows people to collaborate and work face to face so that they can reduce travel, save time, and accelerate decision making without having to purchase or support high-end videoconferencing equipment—and ushers in the possibility of disconnecting the workplace of the future from the office building entirely.

ENERGY EFFICIENCY

AFTER DECADES OF DECLINES, A SHOCKING UPTURN

BTUs per dollar of GDP



Source: US Energy Information Administration

What We Found: The energy consumed per dollar of gross domestic product grew slightly in 2010, the first increase after steady declines for more than half a century.

What We Measured: A 4.5 percent increase in the combined primary energy consumption, by the industrial and commercial sectors, from the US Energy Information Administration, normalized for GDP.

Why It Matters: We waste about 86 percent of all the energy produced in the United States. Experts don't expect that our overall efficiency —not to mention our impacts on global climate change—will improve without major changes to how businesses invest in energy efficiency technologies and techniques. Inefficiency represents a major opportunity to improve energy utilization and reduce the amount of energy we need to produce to keep feeding the economic machine. Moving to renewable sources of energy is vital to sustaining the economy in the future, but the first order of business is to make sure we are using the least amount of energy needed to do the most amount of work.

What We're Seeing: "In 2010, we had an economy that was weakened, and investments were down to 1998 levels. As a result, we weren't

upgrading and moving toward more productive and more energy-efficient technologies in 2010, as we might have, otherwise," says John "Skip" Laitner, the director of economic and social analysis for the American Council for an Energy-Efficient Economy.

That picture didn't much change in 2011. Laitner also notes a worrying trend in his research: slow economic growth isn't sufficient to support efficiency improvements. Because we're not working on improving efficiency, the cost of energy services is going up. "When I say energy services, it's not just the cost of energy, but also all of the associated market constraints," he says. For example: Increased air pollution air leads to more acute illnesses, which lead to more people missing work and less productivity. Also included in energy services are the costs of pollution-control measures and technology to boost energy efficiency and research.

We should see a small increase in efficiency for 2011, once the data is available, but it's not likely to be a sizable one. And it'll be nothing on the scale of what we need to see, says Laitner. "In the next couple of years we're going to see 1.4 or 1.5 percent increase in efficiencies per year—less than half of what we saw in the mid '90s and early 2000s, when there was a 3 percent improvement in efficiencies per year."

It's a non-virtuous circle: In today's weak economy, gross domestic product is not likely to increase by more than 2 percent a year, which reduces the chances for a revitalized job market and continues to eliminate new investment opportunities to power the economy efficiently; it also lowers tax revenue and limits government's ability to invest in climate change solution, such as more energy-efficient technologies and renewable energy.

There are hopeful signs, however, such as President Obama's Better Buildings Challenge, which commits $2 billion to energy upgrades of federal buildings, and another $2 billion of private capital commitments for efficiency upgrades of existing buildings. The goal is to make buildings 20 percent more efficient by 2020.

What It Would Take: Increasing efficiencies will require retooling industrial systems, using integrative design as a model (see our interview with Amory Lovins, page 49). Out of all the resources we extract and industrial processes put in place, we're only turning about 14 percent into useful energy that drives the economy, says Laitner. Doubling or tripling that would be both a major economic driver as well as a significant cut to greenhouse emissions.

That means marrying energy-efficiency efforts with renewable energy—something some utilities are already doing, in part by rolling out smart meters to ratepayers and offering dynamic pricing to encourage the use of renewables.

But we're at a crossroads. Laitner says utilities need to turn ratepayers into investors in new energy-efficiency efforts and technologies by demonstrating how much they can reduce their overall costs. But Amreican ratepayers already are showing signs of fatigue when it comes to taking energy-efficiency measures. A survey by research firm Shelton Group found that 58 percent of respondents would not be willing to invest their money in energy-efficiency improvements until their utility bills increased more than $75 each month.

That is to say, until the pain of energy costs rises, most Americans won't be in the mood to do anything about it.

Until the pain of energy costs rises, most Americans won't be in the mood to do anything about it.

ENERGY'S TWO REVOLUTIONS

Interview with Amory Lovins, co-founder, chairman and chief scientist , Rocky Mountain Institute

GreenBiz: What does the near future hold for businesses looking to make progress on improving energy efficiency?

Amory Lovins: Many more business leaders will start to realize over the next year that the efficiency potential is much larger and more lucrative than had been thought and that the channels for delivering efficiency services and performance to them are maturing.

We've just surveyed the opportunities in depth in a new business book called Reinventing Fire: Bold Business Solutions for the New Energy Era and a supporting website ReinventingFire.com. We had extensive participation by business in both content and peer-review. The findings were startling: The book details how the United States could run a 2.6-fold bigger economy in 2050 with no oil, no coal, no nuclear energy, one-third less natural gas, and at a $5 trillion lower net present value cost, assuming all externalities are worth zero—meaning we calculate savings only from market prices without counting any hidden environmental or social costs or benefits. All this requires no new inventions and no new acts of Congress: the transition is led by business for profit.

We integrated all four energy-using sectors—transport, buildings, industry, and electricity—and found, as you might expect, it's a lot easier to solve the automotive and electricity problems together rather than separately. We also integrated four kinds of innovation—not just the usual two, technology and policy, but also design and strategy, which are even richer in potential. Together, these give you much more than the sum of the parts, especially in creating disruptive business opportunities.

We also detail the opportunities for businesses to get more work out of the energy they're now using. We found that the 120 million buildings in the United States could triple or quadruple their energy productivity with an average internal rate of return of 33 percent. That is, by investing $0.5 trillion, you could return $1.9 trillion in present value. In industry, too, we found ample scope for doubling energy productivity with a 21 percent internal rate of return. These are among the highest and least risky returns in the whole economy.

> The 120 million buildings in the United States could triple or quadruple their energy productivity with an average return of 33 percent.

GreenBiz: A lot has been achieved in terms of energy efficiency over the past few years, especially in commercial buildings. Are there specific technologies or systems that you think hold particular promise for expanding on these gains?

Lovins: I think the big story in buildings, industry, and vehicles efficiency is what we call integrative design. That's not a technology; it's way of combining technologies to get bigger savings at lower cost—that is, to achieve expanding returns, not diminishing returns, to investments in energy efficiency.

(continues on next page)

The Empire State Building, where we co-led the design [of a recent efficiency overhaul], is a good example. The key to the Empire State Building retrofit was an unprecedented onsite remanufacturing of all 6,514 windows so they'd pass light much better than heat. Those "superwindows," combined with better lights and office equipment and other improvements, cut the peak cooling load by a third. Then, instead of replacing and expanding the old chillers, we could renovate them in place and reduce them. That saved over $17 million of capital expenditures, which helped pay for everything else. The overall results have been stunning: payback of the investments in three years, enormously improved financial performance, and higher occupancy with higher rent and higher-quality tenancies. And to [owner Tony Malkin's] great credit, he's rolling these projects out to his whole portfolio and freely sharing all of the analysis and findings with his competitors. That public-spirited generosity benefits the whole industry.

Most people don't realize that half of the world's new generating capacity since 2008 has been renewable.

GreenBiz: How fast is all of this moving? Can we really get there quickly?

Lovins: There are two revolutions going on in electricity. One is saving most of it that's now wasted, and the other is making it differently. Most people don't realize that half of the world's new generating capacity since 2008 has been renewable. If you exclude the big hydro dams that are still being built in some countries, the remaining, more distributed renewables in 2010 were more than a $151 billion business that added over 60 billion watts in that year alone, and thereby exceeded the installed global capacity of nuclear power.

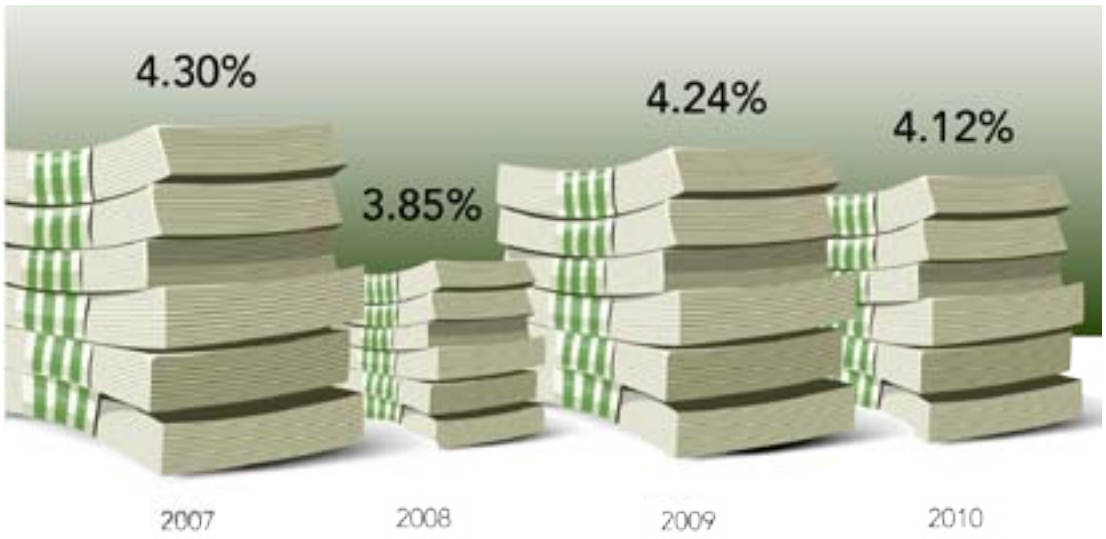
This is a big opportunity, not only for those who sell the equipment but also for all electricity users, because it implements the early stages of a very important shift to an efficient, distributed, diverse, renewable supply system. That's already happening very quickly. Portugal went from 17 to 45 percent renewable electricity during 2005–10, while the United States went from 9 to 10 percent. While congressional wrangling in 2010 halved US wind-power installations, China doubled its wind capacity for the fifth year in a row and blew past its 2020 target. Germany, which gets less sun than Seattle, added 242 percent as much photovoltaic capacity in the month of July 2011 as the United States added in all of 2010. If we catch up to what other countries, especially China, are doing, we're in the midst of the biggest infrastructure shift in history. The efficiency and renewables revolutions are intimately intertwined; each of them helps the other happen better, faster and cheaper.

Amory Lovins is a thought leader who's not content with just thinking. In addition to his work as a consultant to major corporations and ad-hoc advisor to heads of state, he's an experimental physicist whose CV includes designing ultra-light and extremely efficient vehicles as well as showing that the more efficiency is designed into a building or factory, using his disruptive integrative-design approach, the faster its payback and the lower its costs. He co-founded Rocky Mountain Institute, a "think-and-do tank" that conducts research and engages with stakeholders to drive the efficient and restorative use of resources—creating, as he puts it, "abundance by design."

ENVIRONMENTAL FINANCIAL IMPACTS

A DROP IN WHAT COMPANIES ARE COSTING THE EARTH

Cost of environmental damage as a percentage of economic output



Source: Trucost

What We Found: The environmental impacts of the 1,600 companies contained in the MSCI World Index—a stock market index used as a common benchmark for stock funds—increased from 2009 to 2010, the most recent data, but revenue grew slightly more, resulting in a 3 percent decrease in companies' environmental impact intensity. (The data are based on companies' fiscal years, for which they issue reports, but which do not necessarily coincide with calendar years.)

What We Measured: Each year, the UK-based research firm Trucost measures the financial costs of hundreds of environmental impacts of 4,300 of the world's largest companies, including the 1,600 from 24 countries listed in the MSCI World index. It tracks more than 700 environmental impacts for each—a wide range of emissions into air, water, and soil, including a range of pollutants from acetaldehyde to zinc—and assigns a dollar amount to each impact and for each company. This indicator shows the total impacts for the MSCI subset, normalized to economic activity, as a proxy for improvements, or lack thereof, across the economy.

Why It Matters: Aggregated financial impact measures how efficiently companies produce goods and services. It measures ongoing company efforts to improve efficiency, providing goods and services to a growing global population while consuming fewer resources and generating fewer emissions and less waste.

What We're Seeing: The environmental costs associated with companies in the MSCI World Index increased between fiscal years 2009 and 2010. But overall corporate revenue increased even more, meaning that the ratio of emissions to revenue decreased—a seemingly positive sign. But because intensity improved even while total emissions increased, this indicator trend line appears better than it really is.

The lion's share of the financial impacts—that is, the companies levying the highest cost of environmental damage—lie with just four of

the 19 sectors Trucost assesses: utilities, food and beverage, basic resources, and oil and gas. Together, these four are responsible for 65 percent of the roughly $1.2 trillion in impacts. It is well worth noting that these four sectors consist of companies from which companies in other sectors purchase the ingredients for "downstream" products and services. "Those four industries are supplier industries to all the other industries," notes James Salo, Senior Vice President, Strategy and Research at Trucost. "Whereas auto manufacturing isn't one of the top sectors, their purchasing is really driving the impacts." That, he says, underscores the need for companies to take stock of the environmental impacts of their upstream suppliers.

How much did the economy factor into the drop in impacts? Simply put, it's hard to know,. Even though the data are normalized to revenue, which should account for flucutations in economic activity, it's unclear, for example, whether the reduction in impacts had to do with companies being more efficient, or because they made less stuff, selling things they already had in inventory from previous years. As Salo succinctly puts it: "It's complicated."

What's Next: Complexity notwithstanding, there's a growing movement to better understand companies' financial impacts on the environment in order to help them measure, track, and reduce them. Last year, for example, Dow Chemical announced a five-year partnership with The Nature Conservancy to help incorporate the value that nature brings—from water and soil's value to agriculture to the benefits wetlands and reefs offer to insurance companies—into business decisions, plans and strategies, both for Dow as well as in the larger business universe. Dow has committed $10 million to for research on applying scientific knowledge and experience to understanding the interrelationship between Dow's business and the ecosystems in which it operates. Dow plans to publicly share information from the process and create tools for other companies to use.

That's hardly the only research going on about the economics of nature's services. Another is The Economics of Ecosystems and Biodiversity (TEEB) study, initiated by the G8 and five major developing economies and focusing on "the global economic benefit of biological diversity, the costs of the loss of biodiversity, and the failure to take protective measures versus the costs of effective conservation." TEEB make the case for integrating the economics of biodiversity and ecosystem services in decision-making.

A glimpse of this can be seen in the pioneering efforts of Puma, the shoe and sportswear company, which last year said it would measure its use of ecosystems to determine its economic impact on ecosystem services—anything that nature provides: clean water, crops, soil formation, wildlife habitat, protection from storms, and more. Puma is looking at both the impact of its direct operations and its supply chain, and plans to issue an environmental profit-and-loss statement based on its findings. The company is working with Trucost and PricewaterhouseCoopers.

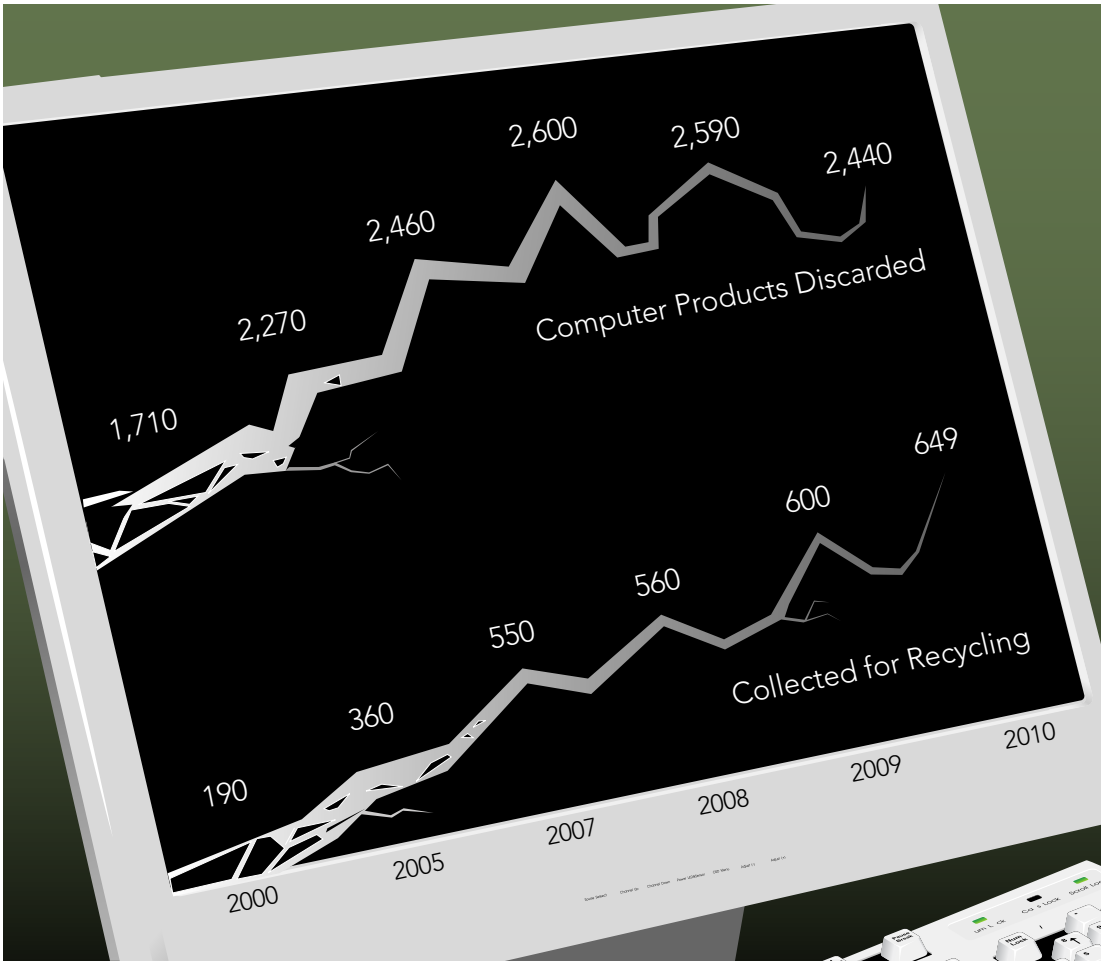
That's the brass ring: fully integrating environmental financial impacts into financial reporting, allowing companies, and all their stakeholders, to get visibility into the financial impacts companies are levying on the planet, and what steps they're taking to reduce them.

That's the brass ring: fully integrating environmental financial impacts into financial reporting, allowing companies and their stakeholders to get visibility into the financial impacts companies are levying on the planet.

E-WASTE

STILL JUST A DROP IN THE DIGITAL BUCKET

Thousands of tons of electronics discarded and recycled annually in the United States



Source: US Environmental Protection Agency

What We Found: Collection and responsible disposal of recycling are improving, but today's successes are still just a molehill compared to the mountain of e-waste to be addressed.

What We Measure: In 2010, 2.44 million tons of electronics were discarded in the United States, and just 649,000 were recovered for recycling. That's a slight improvement over 2009, when 600,000 tons were recycled out of a total 2.59 million tons discarded, according to the US Environmental Protection Agency.

Why It Matters: In addition to significant health and environmental hazards from both landfilled and poorly dismantled electronics, e-waste is increasingly recognized as a waste of valuable and competitively strategic materials.

What We're Seeing: That old saying about trash being like treasure? It turns out that is more true of e-waste than almost any other type of trash. The mountain of gadgets that Americans discard every year—a mountain that this year, for the first time since record-keeping began, didn't

grow over the prior year—contains rivers of gold, silver, copper and a host of materials that have potentially long and valuable lives ahead of them. Those same electronics also pose major health and environmental risks, whether they're sent to landfill or inexpertly dismantled, as is often the case with "artisanal" e-waste operations overseas.

E-waste is on the radar for everyone from environmental groups like the Basel Action Network to the federal government to retailers like Best Buy and eBay. Unfortunately, the trend in e-waste data has been more of the same over the past five years, with the amount of electronics discarded growing at the same rate, if not faster, than the amount collected for recycling.

There are encouraging signs, however, that change is happening behind the scenes that will make it possible to recover more of the materials in gadgets, and to process them domestically and responsibly.

Legislation: At the federal level, a new focus on the economic benefits of responsible e-waste recycling may give this year's bill the legs past bills have lacked. First, requiring domestic processing of electronic waste would be a boon for job creation. Second, by not reclaiming our own e-waste, we're exporting rare and valuable materials—including the aptly named rare earth minerals—to China and other economic competitors. These materials are critical to next-generation technologies—including LED lighting, hybrid and electric vehicle batteries, telecommunications gear, and medical innovations—and many US corporations are keen to keep such resources close at hand.

Standards: Two competing responsible e-waste standards, e-Stewards and R2, continue to take up market share, with the main difference being e-Stewards' requirement of domestic processing of e-waste. While domestic processing requirements have been responsible for much of the resistance to the federal e-waste laws (especially from the scrap recyclers' trade association ISRI), such standards are gaining traction with other stakeholders. Recently, a splinter group of recycling companies has launched the Coalition for American Electronics Recycling to push for a domestic-only e-waste management policy.

Corporate Buy-Back Initiatives: Companies are stepping up to the plate, even in the absence of legislation. Retailers are increasing their incentives for electronics take-back and trade-in programs, in the hopes of reselling equipment that hasn't yet reached the end of its useful life or selling the end-of-life materials to recycling companies. eBay and Best Buy have ramped up their programs to take-back and resell electronics, while Sprint set an ambitious target of creating zero e-waste by 2017. Sprint is also building incentives for cell phone recycling into the buying process, offering instant rebates for old phones when you buy a new one.

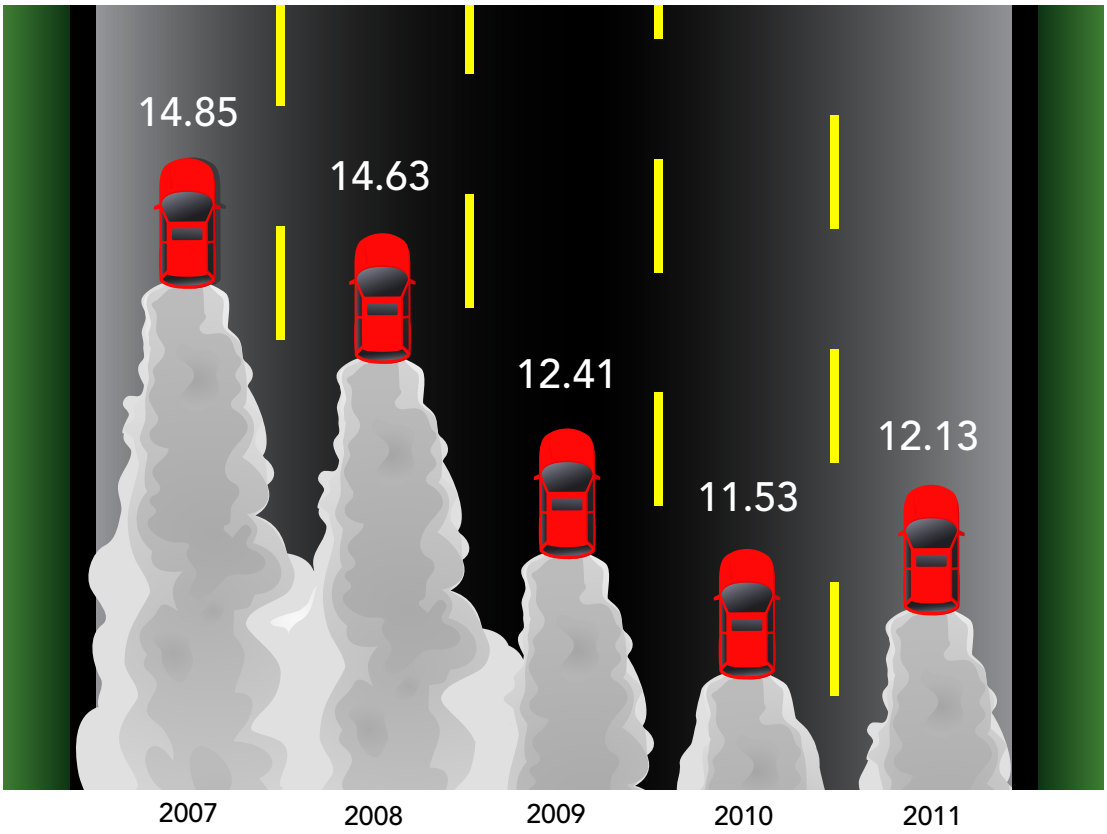
Where It's Going: There will no doubt be some policy debate this year as the latest federal e-waste legislation grinds through Congress. In 2010, President Obama tried to launch a federal strategy for e-waste management, but it's been stalled repeatedly; 2012 may be the year that recommendations get published. In the presumed policy lull, we expect to see companies continue to step up their efforts to capture at least some of the flow of unwanted electronics, including novel efforts like ecoATM's e-waste recycling kiosk, which sat front-and-center at the CES consumer electronics show in January and will roll out nationwide this year. As more people cycle through more gadgets at a more rapid clip, there's incentive aplenty to recapture the value from unwanted electronics, functional and otherwise.

The trend in e-waste has been the same over the past five years, with the amount of electronics discarded growing at the same rate, if not faster, than the amount collected for recycling.

FLEET IMPACTS

EMISSIONS IMPROVEMENTS STILL CREEPING FORWARD

Estimated annual greenhouse gas emissions per vehicle (in tons)



Source: GreenBiz Group research

What We Found: Greenhouse gas emissions per fleet vehicle rose 13.8 percent in 2011, after falling steadily since we first tracked this indicator in 2007.

What We Measured: GreenBiz aggregates fuel consumption data from the largest US fleet companies, including ARI, Donlen, Enterprise Fleet Management, GE Capital Fleet Services, LeasePlan, and PHH Arval, then determines the greenhouse gas emissions per vehicle based on the Environmental Protection Agency's greenhouse gas inventory data. We've revised last year's figures based on newly updated EPA figures.

Why It Matters: The commercial fleet industry is a major contributor to transportation-related greenhouse gas emissions—but it's also a major force for reducing emissions. Through their frequent use, passenger vehicles within commercial fleets emit twice the carbon pollution as personal cars. In fact, the Environmental Defense Fund estimates that fleet passenger vehicles and medium-duty trucks on US roads produce at least 45 million metric tons of carbon pollution each year. Since the inaugural *State of Green Business* report, in 2008, companies have reduced per-vehicle emissions by as much as 15 percent in a single year, saving billions and improving driver behavior along the way.

What We're Seeing: It's hard to know exactly what led to the per-vehicle emissions increase in 2011, but the total number of fleet vehicles fell from 2010 to 2011, indicating that more miles were put on each vehicle. "The [fleets] industry is getting busier," says Doyle Sumrall, senior director of business development for the National Truck Equipment Association. "The year 2009 was the worst for trucks" as the recession squelched demand. This led to a "huge glut of extra vehicles" and so fleet managers reduced fleet size. But with an eye toward lowering costs and improving their environmental credibility, fleet managers are not buying as many new vehicles, while trying to improve utilization and efficiency of current stock.

Across all fleet vehicle categories, from passenger cars to heavy duty trucks, fleet managers have turned in recent years to the use of telematics, which combines in-vehicle telecommunications and information technology to improve routing and efficient driving; right-sizing fleets so that vehicles are well matched to their tasks, in terms of power, size, and fuel consumption; and testing out alternative fuels and drive trains, such as compressed natural gas, electric and hybrid vehicles, to reduce emissions. Fleet companies are also moving toward car-sharing models as a means of reducing the size of passenger car fleets (see page 57).

While production of electric vehicles during 2011 was lower and slower than many predicted, fleets (including rental and car-share fleets) are where EVs are expected to make an initial impact. EVs are scaling up in size, too. Missouri-based Smith Electric Vehicles filed for an initial public offering in 2011 and plans to build a manufacturing facility in New York next year to produce its all-electric medium duty vehicle with a range of up to 150 miles. Duane Reed, Staples, and Frito-Lay are among the companies that have added Smith's trucks to their fleets, which cost one-third to one-half that of conventional diesel trucks (of comparable weight) to operate.

In coming years, Sumrall believes more fleet managers will look closely at the life-cycle costs of the vehicles they bring into their fleets. "People have done their experimentation," he says. "And now they're asking 'Okay, how do I tailor my technology to be the right long-term improvement?'"

Key Players:

- **Delivery Services.** The US Postal Service is leading the charge in reducing the impact of its fleet. Alternative-fuel vehicles account for 20 percent of its overall delivery fleet, and it has replaced 6,600 vehicles with more efficient vehicles, saving 2.2 million gallons of gas a year. USPS also is relying less on vehicles and more on bicycle-powered and foot-powered routes.

  FedEx and UPS have also moved into alt-fueled trucks. Both rely on telematics and driver education to boost vehicle efficiency and software to improve how parcels are loaded for shipping. FedEx Express got into the act this year, announcing it will more than double its fleet of all-electric vehicles to 43 and increase its use of hybrid-electric vehicles. UPS has been using hydraulic hybrids. In addition to capturing power through the braking system, hydraulic hybrid engines can be shut off when stopped or decelerating.

- **Municipalities.** Many cities are reducing the emissions of their fleets, particularly waste-hauling trucks. In addition to using routing software to reduce fuel and optimize each truck's time on the road, waste collection agencies are turning to a resource they've got plenty of to fuel their collection trucks: landfill gas. DeKalb County, Ga., is one of many cities and counties converting its trucks to operate on compressed natural gas supplied by a processing facility at one of its landfills.

Over the coming years, fleet managers will look closely at the lifecycle costs of the vehicles they bring into their fleets.

CAR-SHARING: A SOLUTION FOR FLEET MANAGEMENT

By Lee Broughton, Corporate Sustainability, Enterprise Holdings

Providing sustainable transportation and mobility solutions has been at the core of our company's mission for more than 55 years. With this mind, Enterprise Holdings—which owns and operates our Enterprise brand as well as the National Car Rental and Alamo Rent A Car brands—has helped advance a new tool for companies looking to enhance fleet management operations and sustainability initiatives: car sharing.

In 2005, the Enterprise brand introduced hourly car rentals in large urban centers as a natural extension of our business rental program. Then, in 2007, we launched our membership-based program WeCar by Enterprise B2B to embrace and help speed the adoption of car-sharing technology, and the program has now expanded to more than 25 states. Our experience suggests that car sharing can offer what many businesses, universities, government offices, military bases, and other facilities are seeking: a more nimble, accessible, and energy-efficient vehicle that can quickly respond to seasonal, geographic, and daily fleet demands. This, in turn, helps ensure drivers find WeCar vehicles when and where they are needed, while advanced telematics simultaneously help boost vehicle utilization and reduce costs.

The growth of nonprofit and for-profit car-sharing services—at transportation hubs, corporate parks, college campuses, and other high-density locations—is highlighted elsewhere in this report. And while car-sharing's novelty, convenience, and cost-efficiency have been well documented, there is another major reason for its growth and popularity. Local car-sharing fleets, just like local car-rental fleets, can be used as Petri dishes to introduce innovative equipment and alternative-fuel vehicles, gradually socializing new technology where people live and work. We've offered hybrids for years in both corporate and retail programs, and we're currently offering electric vehicles in many WeCar programs. These fleet enhancements are allowing some partners to dramatically reduce the carbon footprint of their fleets.

To that end, we consider car sharing to be part of the ongoing local mobility evolution and another step toward more efficient, sustainable transportation solutions. Given such attributes, it's not surprising that car sharing sometimes can be used to reduce corporate fleet overhead. Many of our clients have leveraged car-sharing technology to reduce their traditional fleets by 30 percent or more—and they are able to start allocating these expenses on a broader basis since vehicles no longer are assigned only to certain employees or departments full time.

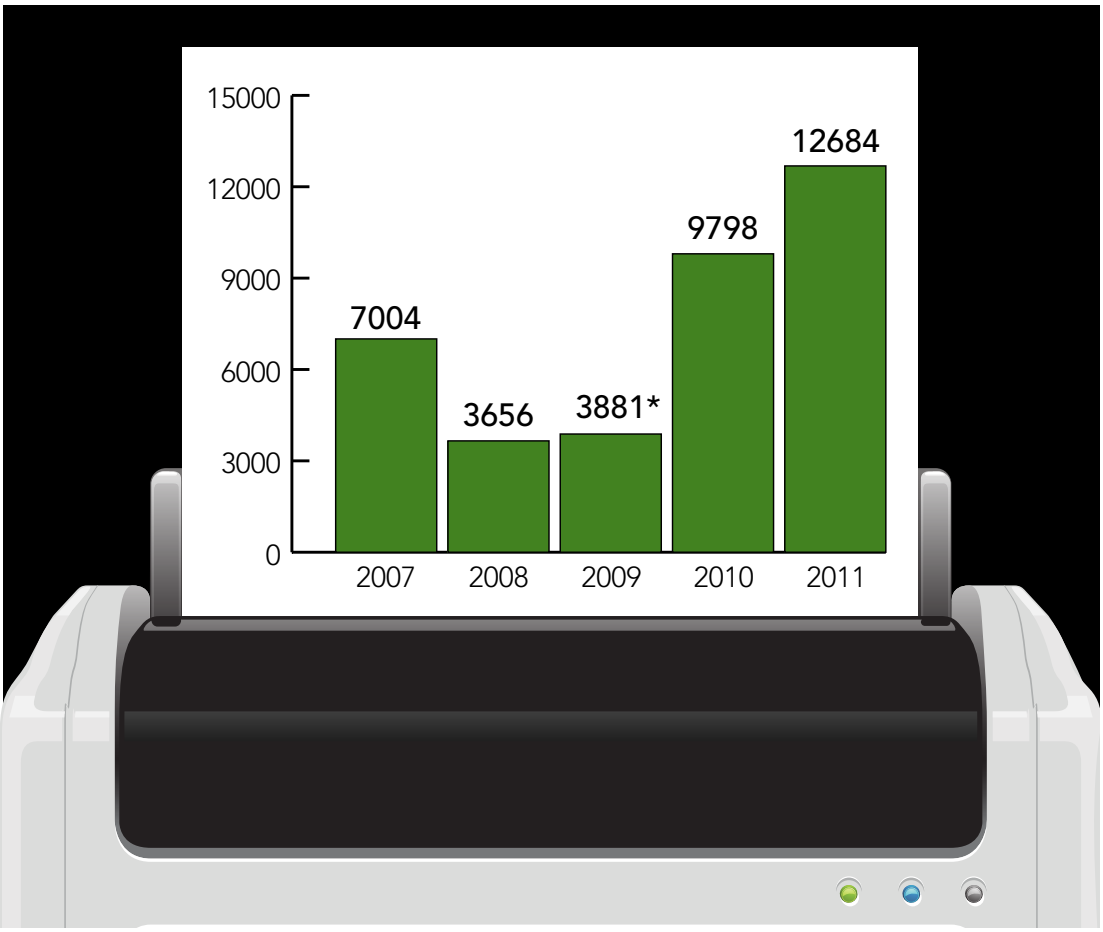
There's an added bonus: WeCar supplements and facilitates our Rideshare vanpooling program. Rideshare serves both individual commuter groups and large employer work sites, with the average van freeing up nine parking spaces and eliminating 12,500 pounds of carbon dioxide a month. WeCar and Rideshare also help reduce traffic congestion and fuel consumption and, in the process, support long-term sustainability initiatives.

As a result, innovative fleet management now includes car sharing—along with car rental, car leasing, and vanpool programs—particularly as businesses incorporate their sustainability goals into their comprehensive, long-term local transportation planning.

GREEN IT

IT'S TIME FOR STANDARDS TO REBOOT

Number of computers certified by Energy Star and EPEAT



*Denotes year of transition to new level of Energy Star certification requirements
Source: GreenBiz Group research

What We Found: Green labels have come to stay for computers and displays, with double-digit increases in both Energy Star and EPEAT certifications—but electronics manufacturers are coasting to success, thanks to aging standards.

What We Measured: The number of products achieving Energy Star certification went up 20 percent over last year, while EPEAT certifications rose 37 percent.

Why It Matters: As the world shifts to conduct more of its business digitally, green IT—from green design to energy efficiency to easy recyclability at end of life—will be increasingly important to make step-changes in energy and materials sustainability.

What We're Seeing: Green IT has proven to be one of the consistently most promising data sets we research, and this year's data is no different.

First, the data: We measure adoption of green IT based on the number of computers and displays that earn certification under Energy Star

and EPEAT. And those figures continue to show steady growth, if not quite as rapid as in years past.

Those figures are slightly complicated by the fact that both data sets are somewhat long in the tooth: EPEAT standards haven't been updated in five years, and Energy Star 5.0 is nearly three years old; given the ever-improving state of computer efficiency, it's gotten easier to design machines to meet such aging standards.

But the growth in certifications does indicate an increase in awareness of energy efficiency in IT products. EPEAT, in particular, is both rapidly expanding its reach around the globe and setting its sights on a broader range of products domestically. The market's rapid shift to portable devices—especially laptops, tablets, and e-readers—also drives the growth in demand for energy-efficient electronics.

Beyond green IT certifications, another trend in the greening of IT is cloud computing, as companies shift ever more of their computing operations beyond their own four walls, and major players like Amazon, Microsoft, and Google step up to become the world's data centers.

Despite an ongoing debate about the security and environmental benefits of outsourced computing, there's little doubt that cloud companies, driven by direct bottom-line benefits, have a strong incentive to run their massive operations as efficiently as possible—including energy-efficiently. And the corporate data center is certainly in need of a push: Estimates by IT leaders suggest that as many as 30 percent of servers are comatose—they're on, but they're not doing anything, and the energy used to power them is simply wasted.

Where It's Going: The next year will almost certainly continue to speed the adoption of green IT certifications—unless either or both standards raise the bar. If Energy Star 6.0 is made final in 2012, expect to see a significant drop in the number of products bearing the label—although such a drop is actually a good sign, since it will prod manufacturers to step up their energy performance. The same goes for EPEAT, although since the standard is likely to expand its reach to cover printers and televisions in 2012, don't hold your breath for an EPEAT 2.0 in 2012. Outside of certifications, we expect to see more collaboration and further innovation among IT giants, as the trend toward openness continues and the major players share their skills to bring everyone up to speed.

The evolution from Energy Star 3.0 to 5.0 between 2008 and 2012 will drive down the energy used by large televisions by as much as two-thirds.

Key Players

- **IT leaders:** Google and Facebook in particular represent the welcome new trend in openness, at least around energy and carbon, in the IT sector. Facebook's Open Compute Project shares detailed specifications to help anyone build a cheap, high-powered, and highly efficient server. Though it was launched last spring, expect the initiative to make bigger impacts in 2012.

- **Greenpeace:** The well-known rabble-rousing organization has notched significant successes in campaigns against Apple and Facebook, and its ongoing Guide to Greener Electronics serves as a kind of priority-setting guide for the industry.

ICT AND THE FUTURE OF LOW-ENERGY COMPUTING

By Jonathan Koomey, Ph.D., Consulting Professor at the Department of Civil and Environmental Engineering, Stanford University

The performance of computers has shown remarkable and steady growth over the past 60 years. The electrical efficiency of computing—the number of computations that can be completed per kilowatt-hour of electricity—has doubled about every 18 months since the dawn of the computer age. The existence of laptop computers, cellphones, and personal digital assistants was enabled by these trends, and has led to continuing, rapid reductions in the power consumed by battery-powered computing devices. And that in turn has made possible new and varied applications for mobile computing, sensors, and wireless communications and controls.

The most important of these trends is that the power needed to perform a task requiring a fixed number of computations will fall by half every 18 months, enabling mobile devices to become smaller and less power consuming. Alternatively, the performance of some mobile devices will continue to double every 18 months while maintaining the same battery life—assuming battery capacity doesn't improve. These two scenarios define the range of possibilities. Some applications (like laptop computers) will tend towards the latter scenario, while others (like mobile sensors and controls) will rely on increased efficiency.

These technologies will allow us to better match energy service demands with energy service supplies, and vastly increase our ability to collect and use data in real time. They will also help us minimize the energy use and emissions from accomplishing human goals, a technical capability that we sorely need to combat climate change. The environmental implications of these trends are profound and only just now beginning to be understood.

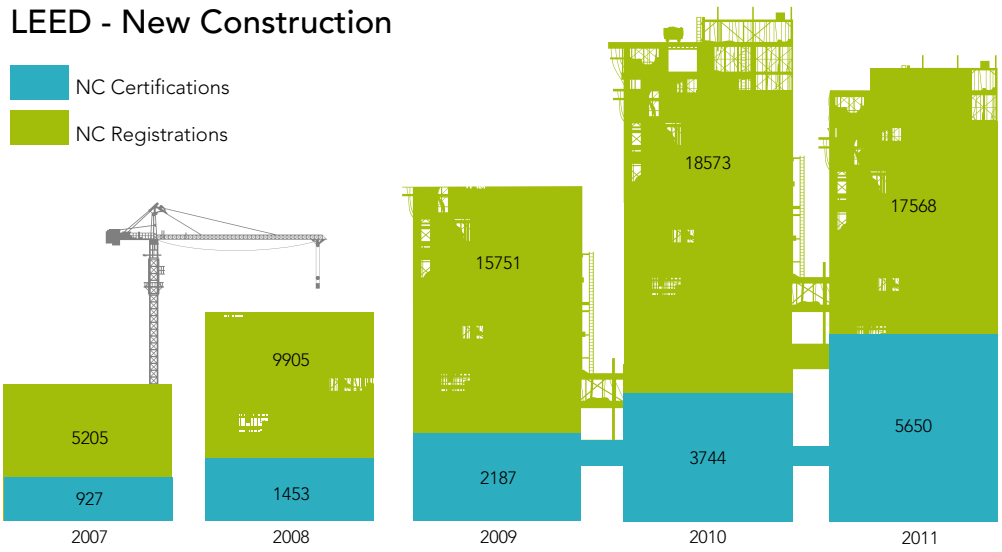
As an example of what's possible using ultra-low-power computing, consider the wireless no-battery sensors created by Joshua R. Smith of Intel and the University of Washington. These sensors scavenge energy from stray TV and radio signals, and they use so little power that they don't need any other power source. Stray light, motion, or heat can also be converted to meet slightly higher power needs, perhaps measured in milliwatts.

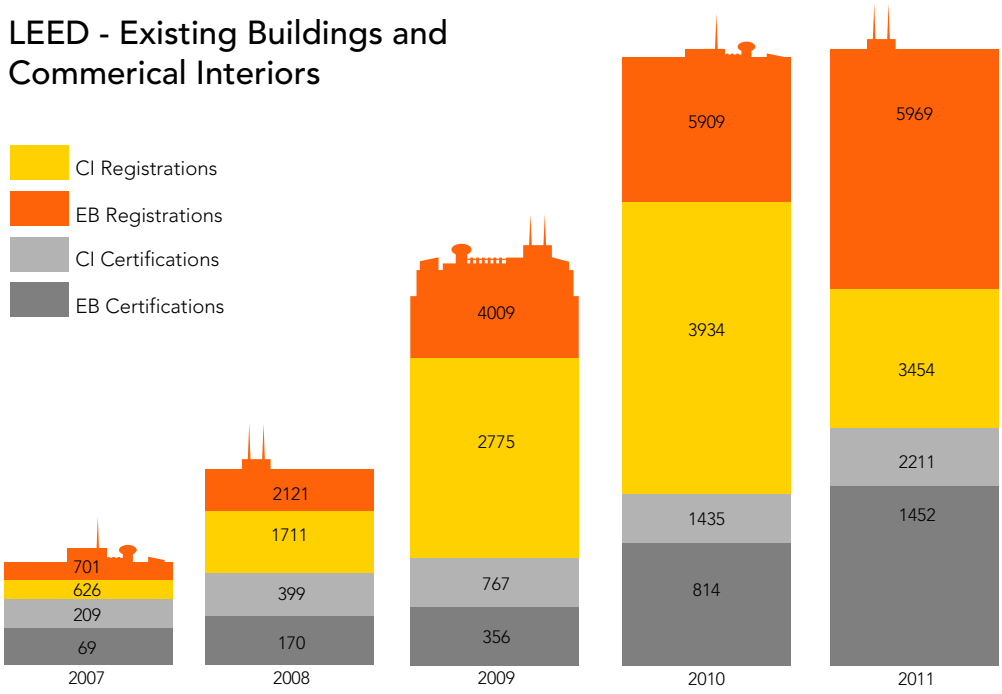
The contours of this exciting design space are only beginning to be explored. Imagine wireless temperature, humidity, or pollution sensors powered by ambient energy flows, sending information over wireless networks, and which are so cheap and small that thousands can be installed where needed. Imagine sensors scattered throughout a factory so pollutant or materials leaks can be pinpointed rapidly and precisely. Imagine sensors spread over vast areas of glacial ice, measuring motion, temperature, and ambient solar insolation at fine geographical resolution. Imagine tiny sensors inside products that tell consumers if temperatures while in transport and storage have been within a safe range. These will help us lower greenhouse gas emissions and enable vastly more efficient use of resources. The possibilities are limited only by our own cleverness.

Koomey is one of the leading researchers on energy-efficient computing and the economics of reducing greenhouse gas emissions. This essay is adapted from his forthcoming book Cold Cash, Cool Climate: Science-based Advice for Ecological Entrepreneurs.

GREEN OFFICE SPACE

NEW BUILDINGS IMPROVING FASTER THAN EXISTING ONES





Source: US Green Building Council

What We Found: Despite a downturn in the real estate market, new construction projects in the United States continued to pursue LEED green building certifications. However, interest in LEED certification among owners of existing buildings dropped from 2010 to 2011.

What We Measured: 2011 saw nearly 2,000 new offices certified under the US Green Building Council's Leadership in Energy & Environmental Design (LEED) rating system, with the majority of that growth coming from newly constructed buildings. Meanwhile the number of buildings

seeking the relatively new LEED for Existing Buildings certification dropped in 2010 after rapid growth in 2008 and 2009.

Why It Matters: There are 4.8 million commercial buildings in the United States, and collectively, they are responsible for 46 percent of the nation's building energy use. Addressing the impacts of the built environment is key to addressing a wide range of environmental issues. Also, green workspaces are often more efficient, both in terms of operating costs and in the ability to accommodate people comfortably in less space, thereby cutting real estate costs. And studies have shown that green workplaces are healthier and promote higher productivity and employee satisfaction.

What We're Seeing: Despite the recession and a sagging real estate market, green office spaces command a premium and post above-average occupancy rates. Rents are 4 percent higher for Energy Star–rated buildings and 5 percent higher for LEED-certified buildings. Green office buildings also sell at a premium—about 25 percent for both LEED and Energy Star.

"Tenants and their brokers increasingly understand that many of the benefits of green office spaces accrue to the tenant and are therefore using sustainability as a way to determine which office space fits their needs," says Gary Holtzer, global sustainability officer at Hines, a privately-held developer and property manager with a long-standing commitment to building, owning, and operating green office buildings.

"Market dynamics being what they are, people naturally are willing to pay more for quality and, if it's accessible financially, more people are willing to buy quality," says Rob Watson, CEO of EcoTech International, senior contributor to GreenBiz.com, and a founder of the LEED rating system. "Although the rent might be higher for green space, the operating costs are also lower and thus the net premium to the occupant is smaller than one might imagine."

Holtzer cites talent retention as another part of green buildings' allure. "Our clients' newest and youngest employees are demanding green workspaces," Holtzer says. "For the newest entrants into the workforce, acting sustainably is critical. Many of our tenants see occupancy in a green building as a tool to attract and keep the brightest and most productive workforce."

Two initiatives from the federal government—the revision of the General Services Administration (GSA) green leasing guidelines and President Obama's $4 billion Better Buildings Initiative—are likely to fuel more growth in green office space in 2012. The federal government is by far the biggest tenant in the country, and the GSA handles leasing for 193 million square feet. While not a code or regulation, the Better Buildings Initiative is likely to fuel growth in the green building market as well. As Watson says: "It's difficult for a $4 billion initiative not to make an impact."

Key Players:

- **Citigroup.** The financial services company has been leading the charge to design and implement energy efficiency financing tools in the United States. Citi, along with Deutsche Bank and JPMorgan Chase, is looking to finance energy-efficient retrofits via a financial vehicle similar to that employed by energy services companies.
- **Johnson Controls.** A leading provider of equipment and services for both public- and private-sector buildings, Johnson Controls earned $4.1 billion in its Building Efficiency business during Q4 2011, up 14 percent from 2010. All five segments of its Building Efficiency business increased from 2010 to 2011, led by the Global Workplace Solutions division (up 24 percent).

The number of both new and existing buildings registering for LEED certification dropped from 2010 to 2011, which will result in a drop in certified green office space in the year to come.

INSIDE LEED'S DISAPPOINTING NUMBERS

Interview with Rob Watson, CEO, EcoTech International

GreenBiz: LEED for Existing Buildings (LEED EBOM) seems to have slowed. Why is that?

Rob Watson: First, the number of buildings is not important when gauging the impact of LEED. If we want to gauge the impact environmentally and financially, the correct measure is square footage. By this measure, the real issue—and the real disappointment—is that the total floor area certified decreased compared to 2010. Registrations performed slightly better—it is hard to be disappointed if anything grows 17 percent in one year—but the truth is that the growth in existing building registrations and certifications needs to double for the next three or four years and maintain that level of certification and registration in order to approach the carbon dioxide reductions science agrees must happen.

There could be any number of things slowing down adoption. Projects that were going to be built new have been repurposed for upgrading existing buildings, which has delayed certain timelines. Large portfolio holders that were going to put multiple buildings into the LEED volume-build program have not yet done so because of delays in getting that program launched. The building market across the board, including existing building upgrades, has also been affected by the financial crisis.

GreenBiz: Are there new regulations or building codes on the horizon that might affect green office space?

Watson: Last year, the International Code Council launched its International Green Construction Code, which puts green code language at the fingertips of progressive code officials worldwide starting in spring 2012. ASHRAE 189 [the technical association's sustainable building standard] also has been in the market for about a year now and people are becoming more familiar with it, so it should not be too long before we see the first official adoption of the standard. We will see a significant impact from the adoption of this standard, both in terms of raising the floor for minimally acceptable green construction, as well as pushing voluntary standards like LEED.

GreenBiz: What general trends do you see in green office space?

Watson: It is difficult to find a tenant lease or construction specification from any major corporation that does not have explicit guidelines for space that is either LEED-certified, Energy Star-certified, or "built to LEED." Most of the major new construction under way has some sort of Energy Star or LEED certification attached to it. This is likely to drive the existing building stock because buildings that were formerly "Class A" are no longer in this category, principally because the buildings coming online have an environmental certification.

GreenBiz: What effect will the new GSA green leasing guidelines have on the overall market?

Watson: A common refrain that I hear is that the old, 20th-century structure of leases discourages the investment in green, either from the tenant side or from the owner side. Although the impetus to go green is not strictly financial, lease structures that do not allow the investment to be recouped by the investor—whether it is the tenant or the landlord—can put a brake on the move to go green. The structuring of lease documents to encourage green actions can only benefit the market as a whole.

GREEN POWER USE

LARGE-SCALE INSTALLATIONS ARE A BRIGHT LIGHT

Percentage of all US electricity generation from non-hydropower renewable sources

Source: US Energy Information Administration

* As of September 2011

What We Found: Renewable energy still makes up just a small sliver of the total US energy pie, but the quantity has more than doubled since 2001 and the rate of growth increased in 2011.

What We Measured: 4.56 percent total US power generation comes from non-hydro renewable energy, up from 4.1 percent in 2010, based on data from the US Energy Information Administration.

Why It Matters: Businesses are heavy consumers of energy worldwide. As renewable energy sources begin to replace fossil fuel–based energy sources, carbon emissions will decline. At the same time, the greater the renewable energy capacity, the better the business case becomes for on-site renewable energy as well as utility-scale projects, as costs continually drop.

What We're Seeing: Renewable energy installations are still far behind where they need to be to stem the rise of greenhouse gases, but the market is maturing and 2011 saw rapid growth in the sector thanks largely to plummeting prices for photovoltaic (PV) panels.

The price of polysilicon dropped 89 percent between February 2008 and August 2011. In addition to making the business case stronger for companies to own their solar systems as opposed to signing power purchase agreements, the newly low price of PV spurred various utility-scale solar projects, many of which had been stalled thanks to the recession, to move forward.

"The cost reductions that are happening have a real material impact on utility-scale solar

projects," says Dan Shugar, CEO of Solaria. In California alone, there are more than 10 gigawatts (GW) of solar PV projects planned, up from 0.3 GW of operating projects today. These aren't pie-in-the-sky projects, either: 8.6 GW of that future capacity is already contracted for through power purchase agreements.

By the end of first quarter of 2011, non-hydro renewable energy accounted for about 10 percent of the global power supply, according to the REN21 Renewables 2011 Global Status Report. With solar posting a record third quarter in 2011, that number could be significantly larger by year's end. As of September 30, 2011, the total solar installed in the United States was over 1 gigawatt, compared to 887 MW in 2010.

The wind industry also grew in 2011. At the end of the third quarter, 8,400 megawatts (MW) of wind power capacity were under construction in the United States, and installed wind power capacity stood at 3,360 MW, exceeding installations up to the same point in 2010 by 75 percent. Despite increasingly loud complaints about aesthetics, noise pollution, and the impact of turbines on bird and bat populations, wind power looks set to continue growing. China alone plans to install more than 30 MW of wind power by 2012. We're likely to see increased geothermal capacity in the years ahead as well, thanks to technological advancements that are opening up new possibilities. And while wave and tidal technologies are still nascent, both made big strides toward commercialization in 2011 with the largest pilot installations yet off the coasts of both Ireland and the United States (Oregon).

What to Watch: Three key factors are likely to have a big impact on green power in 2012:

- Polysilicon prices. If they stay level or drop, PV is likely to continue to dominate the solar market. That means concentrating solar power (CSP) could see a lull, but utility-scale solar plants may come online sooner than anticipated. Lower PV prices aren't great news for everyone, though. 2011 saw the shuttering of several leading solar companies, including Evergreen Solar and SpectraWatt. Companies in the CSP space were equally unsettled by low PV prices as major utility-scale solar farms, such as the California- and Nevada-based Solar Millennium, opted to replace planned CSP installations with more PV.
- Section 1603 Treasury Program and federal Production Tax Credit. Set to expire December 31, 2011, the 1603 Treasury Program allows developers to receive a cash grant in lieu of the Investment Tax Credit (ITC). The TGP has supported more than a thousand solar projects representing over $3 billion in total investment. If the program is not renewed, expect to see a downturn for all renewable energy sectors in the United States. The Production Tax Credit (PTC), meanwhile, is set to expire at the end of 2012, pushing developers to complete construction of numerous projects in order to get the tax credit while it's still available.
- Offshore wind. In early 2011, the province of Ontario, Canada, canceled all offshore wind plans, saying it needed to further study possible health effects. The cancellation of offshore wind projects was also seen in the United States in 2011, including the 150 MW Great Lakes Offshore Wind Project. Nonetheless, Secretary of the Interior Ken Salazar and Secretary of Energy Steven Chu unveiled a national offshore wind strategy in February 2011 with a goal of deploying 10 GW of offshore wind capacity by 2020 and 54 GW by 2030.

The market is maturing and 2011 saw rapid growth in the sector thanks largely to plummeting prices for photovoltaic panels.

BEST BUY AND THE NEW CONSUMER ENERGY MARKET

Interview with Neil McPhail, Senior Vice President and General Manager, Best Buy

GreenBiz: You began selling plug-in charging stations this year—why?

Neil McPhail: We saw it as an open area in the launch of electric vehicles. There was a lot of consumer confusion around charging, the choices available, and then who's my partner for that? We had the opportunity to step in and fill that niche, helping customers navigate the confusion and make good choices. One of the things we do at BestBuy is educate consumers around technology and choices, we help to demystify things a little. That's the same whether you're talking about new mobile technology or new clean technology.

GreenBiz: Is it possible we'll see Best Buy selling solar and wind systems at some point?

McPhail: We hear questions around solar and wind all the time. I think there has been more and more curiosity lately because the startup community has created this groundswell of opportunity with different finance models. There's a tremendous amount of interest. We're very interested in understanding our customers' needs and constantly looking for ways to fulfill them.

GreenBiz: What has the reception been to the home energy departments you're piloting in three Best Buy stores?

McPhail: Consumer interest is stronger than we initially anticipated, and that interest has so far been driven by a couple things. First, there are some cool new technologies out there, like the Nest Learning Thermostat. That's an exciting product and an iconic sort of product with a lot of consumer interest around everything from [iPod designer] Tony Fadell to what it does for you and the story behind it. It's a very nice-looking piece of equipment. Second, there are some technologies out there that consumers have been hearing a lot about for a long time, but don't necessarily understand. A lot of the home energy control devices, for example. There's a lot of interest in lighting. We hear all the time, "Why is an LED light more expensive?" and that helps us engage in conversation and demystify that technology a bit for customers.

GreenBiz: Is consumer interest driven by the sleeker, better-designed form factors of these products, or by energy savings?

McPhail: It's the integration of both: a cool, new product and the value it brings to the consumer, particularly those products that interact with devices the consumer already has. In the home-energy control space, for example, we're able to show people in the stores how you can use this new device with your smart phone and turn down the heat when you're at the office, then turn it on a half hour before you're home so you're not wasting a day's worth of heat. That's huge when we can show them that this ubiquitous device that's already been controlling other parts of their life can now be translated to energy efficiency.

GreenBiz: What about business customers?

McPhail: There are a lot of opportunities for technology and knowledge transfer from the home energy space to small and medium businesses. The home energy group can do business-level audits as well and we would love to take the solutions we're seeing for consumers and what we've learned and use them to educate small businesses.

ORGANIC AGRICULTURE

SALES RISING FASTER THAN CONVENTIONAL FOODS

Sales of US organic food, in million $ consumer sales; percentage of total food sales

Source: US Department of Agriculture

What We Found: After slowing with the Great Recession, the market for organic foods began to climb out of a trough during 2011.

What We Measured: Organic food sales rose 7.7 percent in 2010, according to the Organic Trade Association's 2011 Organic Industry Survey.

Why It Matters: Agriculture accounts for roughly 7 percent of US greenhouse gas emissions, but organic farming practices help reduce that impact in a number of ways, such as avoiding synthetic pesticides and fertilizers and their associated emissions. Soil in organic farmland is also better at recycling organic matter and conserving nutrients than soil on conventional farms, which means it sequesters more carbon. Organic practices allow less nitrates to leach into groundwater, improve biodiversity in both flora and fauna, use more energy-efficient farming systems, and reduce soil erosion.

What We're Seeing: US sales of organic food grew by nearly 8 percent during 2010, says the Organic Trade Association (OTA), a membership-based business association for the organic industry in North America. During the same period, overall food sales in the United States crawled, at just 0.6 percent—the slowest growth in the past decade. Organic fruits and vegetables accounted for 39.7 percent of the total organic food growth and 12 percent of all US fruit and vegetable sales, while organic dairy grew by 9 percent in 2010, accounting for 6 percent of all dairy sales. Combined, these two organic segments represent $14.5 billion in sales.

Not too shabby, but still the $29 billion organic (food and non-food) market represents just 4 percent of all agriculture products. Aside from a few titans, such as the organic dairy co-op Organic Valley, the industry is still just a sprout. More than 60 percent of the OTA's trade members are small businesses.

But the industry's growth shows that it is winning hearts and minds. Organic Valley's CEO George Siemon says the current surge in organics sales

has much to do with the industry's outreach to young families—specifically to young mothers, more of whom are choosing to feed their children organic food.

In addition to healthy sales, there's a growing body of evidence that organic agriculture can—despite conventional wisdom—be scaled up enough to meet global food demand. Findings of the Long-Term Agroecological Research Experiment, a 13-year-old study run by the Iowa State University's Leopold Center for Sustainable Agriculture, show comparable yields in organic- and conventionally-raised commodity crops.

Plus, there are troubling signs that conventional farming tools are becoming less useful: Weeds are becoming resistant to potent herbicides, and insects are starting to show tolerance for genetically engineered plants like Monsanto's corn. And research is suggesting that organic farming systems and best practices like integrated pest management can reduce harm from pests and weeds in a chemical-free manner.

Despite the industry's growth, attaining acreage for organic farming is still a big challenge, says Siemon. "Ethanol has shifted the dynamics of feed and livestock. We're seeing 40 percent of corn [grown in the United States] going to ethanol, and that has raised land rent tremendously. This is a real challenge for people looking to get into organic farming," he says, adding that to counteract that, Organic Valley tries to connect landlords who want their land farmed organically with would-be organic farmers who have been priced out by land costs.

Another resource, Siemon says, is acreage coming out of the USDA's Conservation Reserve Program, under which the agency pays rent for acreage along streams and rivers. The land is planted with grasses and trees, which reduce erosion, retain nutrients, and provide valuable habitat for wildlife. As land is cycled out of that program, it's primed for use raising organic crops. "It's our job to try to grab those acres," says Siemon. "But it would be good if the government could encourage that kind of thing."

What's Next: In 2011, sustainable farming advocates (in fact, the whole agriculture sector) were caught by surprise when legislators pushed for an accelerated schedule to renew the Farm Bill, a massive piece of legal wrangling that is up for renewal in 2012. Advocates called negotiations secretive and worried that farm programs that benefit small producers would be axed by the Super Committee, tasked with cutting trillions from the US deficit.

The committee failed to do anything and now organic farming advocates, such as the Organic Farming Research Foundation (OFRF), are gearing up for a fight in 2012 to protect the funding that supports organic certification, research, standards, crop insurance, and data collection.

The Farm Bill is criticized for favoring commodity crops and Big Ag through its subsidies program. OFRF and other groups point to the strong growth of the organic industry, its role as a jobs engine, and forecasts that show demand for organics will outstrip supply in the coming years as reasons the industry should receive more government backing.

There's a growing body of evidence that organic agriculture can be scaled up enough to meet global food demand.

ORGANIC ISN'T ENOUGH; HERE'S WHAT REALLY MATTERS

By Arlin Wasserman

What we eat has a major impact on the economy and the planet: The global food and agriculture industry uses about a quarter of all arable land, is responsible for 20 percent of greenhouse gas emissions, and food production and service employs about one billion people, many of who live in poverty.

While interest in food choices—where it comes from, how it's grown, who grew it—increases (at least in the United States and Europe), consumers are ceding more of those choices to businesses by eating fewer home-cooked meals. Making more of those choices has been a big opportunity for the food service industry and companies like Sodexo, one of the world's leading providers of contracted services to business and institutions, including food service. Sodexo now serves about 50 million people a day globally, including 9 million meals in the United States alone.

In 2007, Sodexo began a new chapter in its approach to sustainability, especially in food service operations. It recognized that its ability to impact the health of the planet, the people it serves, and the communities where it operates was tied to its overall operations. Its impact and opportunity lies in the purchasing choices made on behalf of the millions of people it serves and its ability to focus those choices to deliver greater environmental and social benefits. For example, Sodexo found the carbon footprint from a couple of items—beef and cheese—was greater than emissions from all office, travel, and fleet operations in North America combined.

Initiatives like Meatless Mondays, which promotes a diet including more plant-based foods and fewer animal proteins, has been one of the early successes toward our goal. So have efforts to promote sustainably produced seafood, tropical products, and livestock. Each has different concerns, from species extinction to reforestation to reducing methane emissions. So by looking only at certified organic food, one would miss the changes Sodexo is trying to achieve.

Certified organic purchases reflect success in the older approach to selling green products alongside products where sustainability isn't on the ingredient list. That's a shift other industries have moved through and the food and agriculture sector is now taking on.

Until 2007, "sustainable" food service was an option available to clients and customers to choose, but didn't leverage Sodexo's national and global purchasing power. Dining formats like PLANit—which focused on certified organic and natural ingredients—mirrored earlier trends in green marketing: better products available at a higher price for a niche market, but not an innovation or driver of change in our business.

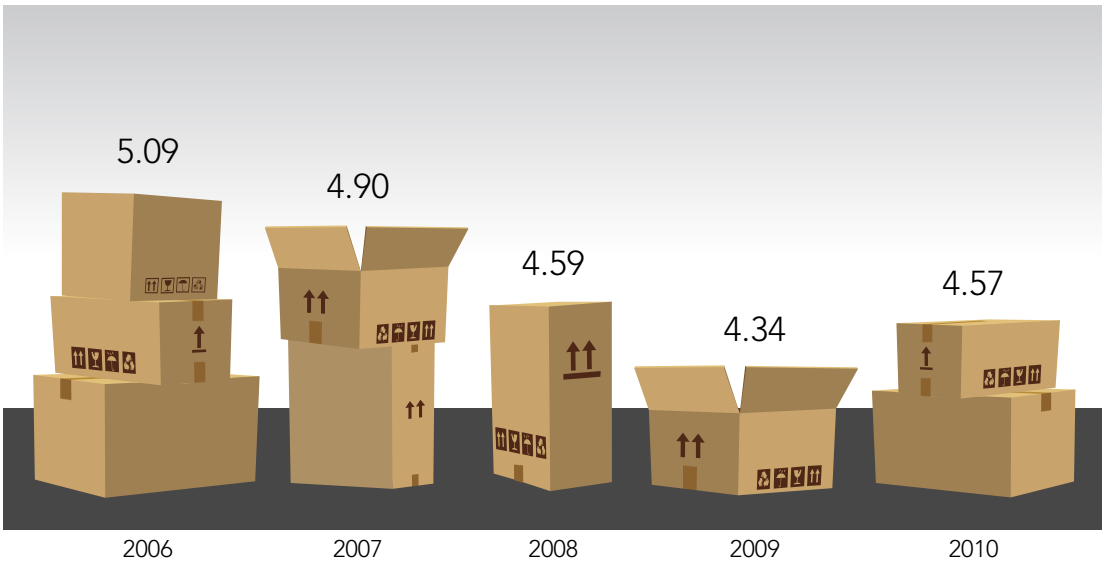
Moving forward, the state of green business in the food and agriculture sector will need to look at more complex indicators of success like improving food production practices in conventional operations and creating new market opportunities for small and mid-sized producers that also are providing ecosystem services by improving water quality, rebuilding soil, and restoring wildlife habitat.

Arlin Wasserman is a partner at Changing Tastes and a fellow at the Aspen Institute. From 2007-2011, he was Vice President for Sustainability at Sodexo.

PACKAGING INTENSITY

EFFICIENCIES ARE FLATTENING OUT

Thousand of tons of packaging material per billion dollars of GDP



Source: GreenBiz Group research

What We Found: Retail packaging has gotten lighter and smaller over the last several years, but an increase in secondary packaging—used in wholesale distribution and e-commerce sales—has helped drive up total material use for packaging.

What We Measured: Packaging material intensity grew 5 percent in 2010—a disappointing change from steady declines over the previous 5 years. We collected data showing the production of paper, plastic and aluminum for packaging in the United States to determine the amount of packaging used, then we normalize this based on the gross domestic product.

Why It Matters: About a third of what you'll find in a landfill is packaging, and businesses are the ones producing it. While we need efforts to improve recycling, we also need less of the stuff to begin with. With some products, such as single-serve beverage containers, the packaging is sometimes the biggest contributor to its carbon footprint.

What We're Seeing: From 2005 through 2009, we watched packaging intensity decrease, slowly but surely. Light-weighting, the practice of reducing the amount of material needed to produce a given packaging type, was a big reason. It's been the low-hanging fruit for manufacturers who want to lighten their packaging load. Kraft Foods, for example, used it as part of a larger effort through which it reduced its packaging intensity by 200 million tons between 2005 and 2010.

"Since we work on various projects related to the sourcing of materials, their design and end of life, the weight reduction we've achieved is based on a combination of projects," says Richard Buino, spokesperson for Kraft Foods. "Many of the projects are driven by how we've 'designed out waste' by reducing the amount of packaging material needed in a particular design. Once implemented, this adds up over time. Another method is altering the sourcing of our packaging materials, such as moving from glass to plastic, or to a composite paperboard canister."

But light-weighting works only up to the point where manufacturers can't safely remove any more of the weight from the packaging, as it needs to protect its products. That's what happened, says Coca-Cola, when it had cut 57 percent, 33 percent and 25 percent from its glass bottles, aluminum cans, and PET bottles, respectively.

This scenario played out among a number of major consumer packaged goods companies, which could be partly why we didn't see further declines in packaging weight in 2010. As for why the weight increased a bit, green packaging advocate and consultant Dennis Salazar thinks that could be due, ironically, to these aforementioned light-weighting efforts. Some manufacturers have removed so much weight, he says, that they're seeing more breakage of products in transport. The fix? Beef up the secondary packaging used to ship the goods.

Add increasing demand in the e-commerce sales channel, and secondary packaging looks like a serious culprit. "Most people only think about primary packaging, but think of the shift we're seeing from retail to e-commerce," he says. That's where the secondary packaging, used to ship individual items (as opposed to the cartons used to ship items in bulk to retail stores) comes into play.

"If you order some ink cartridges for your computer online, rather than going into a store, and then you take all of the secondary packaging it arrives in, and you cut open the box and air pillow or whatever is used to protect it, and you lay all that out, it might be 6 square feet, and maybe weigh 8 ounces. If you did that with the primary packaging, that might only be one square foot and maybe one ounce," says Salazar.

What to Look For: Sourcing better materials for packaging is another positive approach companies can take—even though it's not revealed in the weight-based statistics we use here.

Using recycled materials helps create markets and encourages growth in recycling programs, while also reducing the environmental impacts of packaging. One positive sign of change is that the amount of recycled PET produced in the United States has been steadily increasing—up 2.2 percent between 2009 and 2010, and up 121 percent between 2001 and 2010, according to the National Association for PET Container Resources.

Coca-Cola and PepsiCo are both making major moves into switching from oil to agricultural byproducts for source material for their PET, and they're already offering 100 percent bio-based high-density polyethylene. The tougher part is scaling up a bio-based source for terephthalic acid, which accounts for 70 percent of PET bottles by weight. Coca-Cola has announced partnerships with three materials science firms to ramp up this research.

Some manufacturers have removed so much weightthat they're seeing more breakage of products in transport. The fix? Beef up the secondary packaging used to ship the goods.

A PROGRESS REPORT ON WALMART'S SUSTAINABLE PACKAGING SCORECARD

By Ronald Sasine, Senior Director of Packaging, Walmart

As the world's largest retailer, Walmart's actions can drive throughout our industry, among manufacturers, and along our global supply chain. These suppliers share our vision and understand how much we value the environment, and they are taking steps to reduce the impact of their packaging. They have recorded packaging details for over 650,000 items (including Walmart in-house and national brands) in our sustainable packaging scorecard, launched in 2008.

One of our goals is to reduce the emissions of greenhouse gases that result from packaging the products we sell. We're measuring these improvements and comparing current emissions per unit of product to the improvements that a new package would potentially bring. Many of our largest opportunities involve not just packaging, but our entire network of distribution, logistics, and in-store operations, and the results can be far-reaching. This type of holistic analysis has helped drive packaging reductions across our stores and clubs:

- We launched a new bottle for our private label Oak Leaf wine. It weighs 25 percent less than the current bottle, which lowers shipping cost, saves 6,700 tons of glass from landfills, and $0.20 in savings per bottle that is passed along to customers.

- We partnered with our toy suppliers to remove the frustrating wire ties often used to secure a toy in its packaging. The wire ties have been replaced with a much better option—paper string made of 100 percent recyclable pulp—which results in eliminating over a billion feet of wire ties that would eventually end up in landfills.

- By working with our Great Value yogurt supplier to reshape containers and shift from a single-serve container to a four-pack, we reduced shipping costs, saving about 20 million gallons of diesel fuel annually, while eliminating the equivalent of 48 garbage truck loads of packaging.

- We changed the dimensions on a series of in-store foodservice items—think vegetable trays—that improved our freight efficiency by 96 percent and shelf-stocking efficiency by half, reduced CO_2 emissions by 765,000 pounds, and cut in-process scrap materials by 629,000 pounds a year.

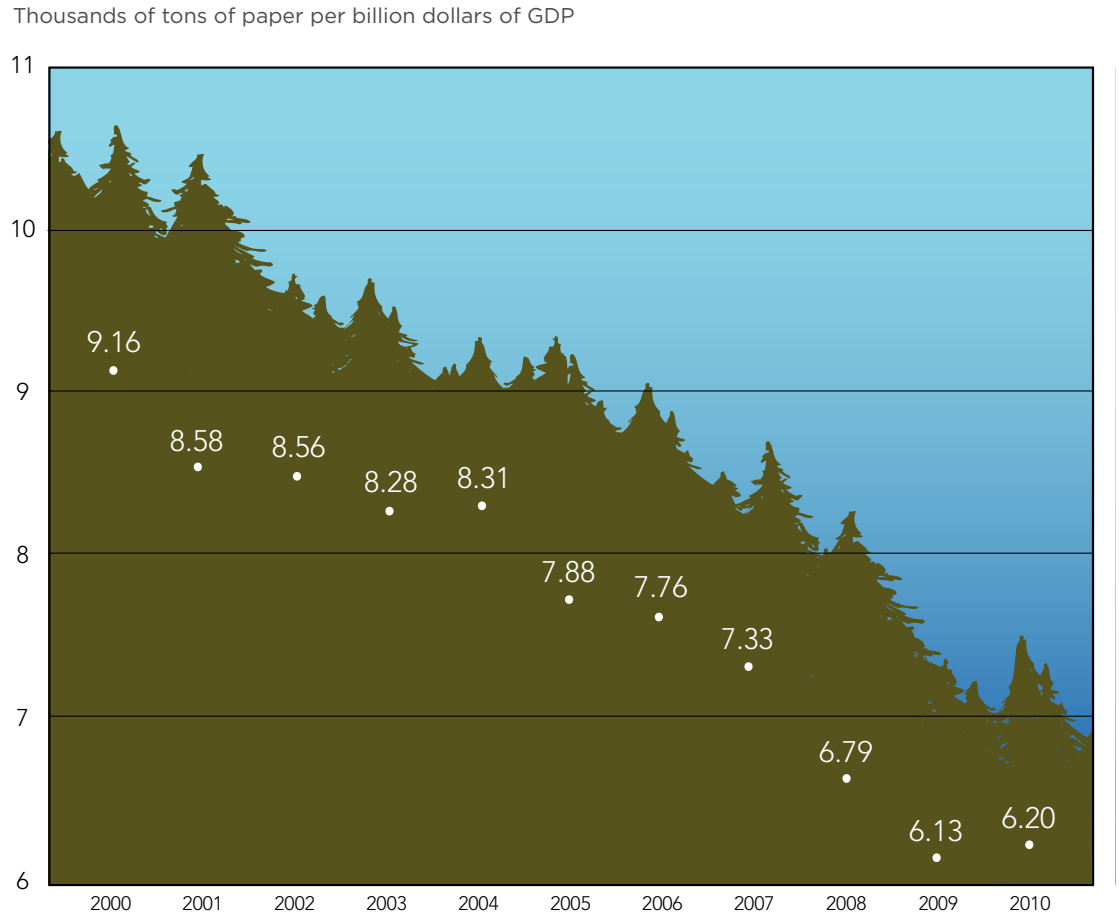
- We've found specific ways to eliminate unneeded packaging components and simplify the way our products are shipped, and we've achieved multi-million dollar savings in a variety of our highest-volume product categories

A secret of what we are doing is this: The most meaningful improvements we are making are those that appeal to our consumers and do a better job of delivering high-quality products to their homes. When our customers capture the impact of these packaging improvements in their own lives, whether through a price reduction at shelf or through better performance in their homes, they are much more likely to reward our actions with their repeat purchases.

Likewise, when these changes drive operational savings and labor efficiency in our stores, we drive sustainability right to the bottom line.

PAPER USE AND RECYCLING

SOME RECENT IMPROVEMENTS ARE ERASED



Source: American Forest & Paper Association

What We Found: Paper use has been on the decline for years, but it rebounded slightly in 2010. Recovery rates continued their upward march, however.

What We Measured: We used 6.2 tons of paper per billion dollars of GDP in 2010, according to the American Forest & Paper Association (AF&PA). That's up slightly from 6.13 tons in 2009, but we reclaimed more of that paper than ever, with a 63.5 percent recovery rate.

Why It Matters: Despite advances in digital workflow, paper still has its place in the office, as well as in the factory. Today, the AF&PA estimates that paper makes up about 5 percent of the nation's manufacturing GDP. Reducing waste of office paper, packaging materials, and paper products are all business-related issues, and getting paper out of the waste stream is a sign that companies are paying attention to their material use at the office—and in their products.

What We're Seeing: Over the past 13 years, paper intensity—paper use per billion dollars of GDP—has declined steadily, and recycling rates have risen simultaneously, meaning that less paper is being used, and even less of what's used is going into landfills. But 2010 saw a leveling off of recovery rates and a slight increase in paper intensity. Whether this is the beginning of the plateau we predicted in last year's report, or just a blip, remains to be seen. Likely, it's just a blip.

The economy has had a profound impact on nearly every indicator in our set over the last few years, and paper is no exception. Paper use has steadily dropped in good economic times as well as bad, though after the recession of 2002 and 2003 there was a similar uptick in 2004. It seems likely, then, that intensity will shrink again in the coming years.

As for collection, recyclers and paper manufacturers both point to an increase in single-stream recycling collection as one reason the 2010 numbers may have wobbled. Overall, these recycling programs, which mix paper, plastic, glass, and metals in the same bin, have helped boost collection rates across residential markets. That's especially true for plastics and glass, which have lagged behind paper in recycling rates. According to Lewis Fix, Vice President of Brand Management and Sustainable Product Development at Domtar, the long-term impact on paper recycling is somewhat ambiguous.

"I've heard some folks say it's 'bad for paper' because it's tough to keep that product in that top tier of recycled paper," he says. "The stuff you put in your blue bin; that's not going to go back to the top of the food chain." With more materials mixed up in the bin, paper that ends up in the recycling can get wet and dirty from other items, making it harder to collect clean, dry fiber for recycling back into the high-quality paper markets. But Fix cautions, "I talk to other people that are very in touch with the recycling industry that would say exactly the opposite. Making it easy ... has turned far more people into recyclers than ever before in the past."

While the jury is still out on the impact of single-stream programs, Waste Management says it's beginning to look at extending its efforts out of just residential markets and into commercial markets, where paper makes up a higher percentage of the waste stream. That could help boost recovery rates in the commercial sector, supporting continued progress on our indicator in the years ahead.

What to Look For:

- **New Paper Products:** Waste Management says it's working to capture more value from paper that's recovered through single-stream programs by looking at new products. While the company isn't likely to begin manufacturing its own recycled paper any time soon, look for it to begin piloting new ways to pull value out of the waste stream, beyond traditional recycling. First up? Fuel pellets from recovered paper that doesn't make the grade for traditional recycling.

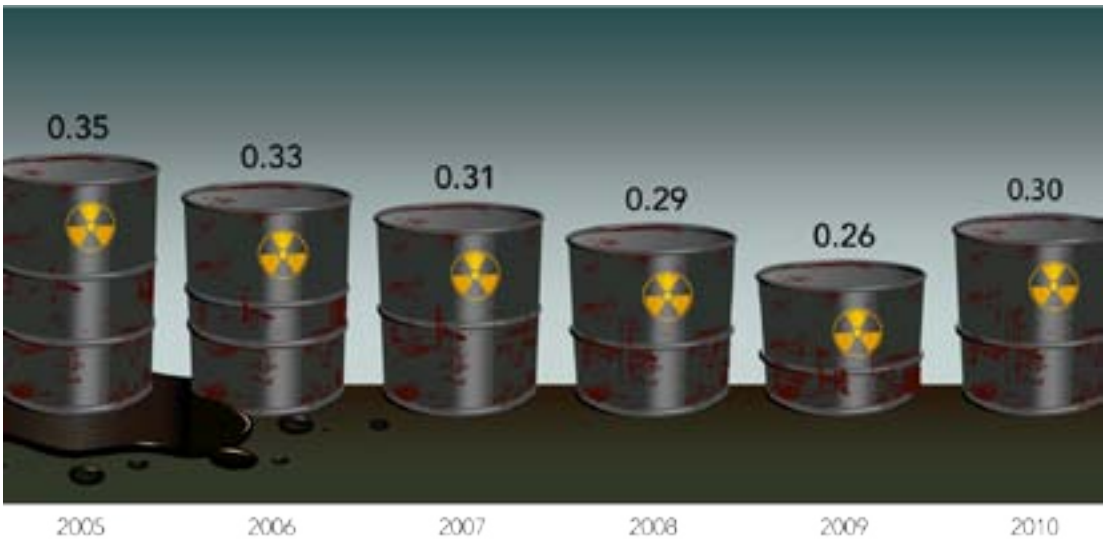
- **Paper Use Rebound.** While reducing paper use has become a marquee environmental behavior at home and at work, there's a growing awareness that substituting digital products for paper use isn't always the best environmental choice (see E-waste and Green IT indicators, pages 53 and 58). While it may not happen in 2012, Fix says he expects to see paper use rise within the next few years. "When the automobile was invented, a lot of cities ripped out their transit—streetcars, lightrail systems, etc." he said. "They're starting to put them back in now." He expects to see something similar happen where paper use is concerned: "I think that there's probably some similarity that's going to happen with digital communications, digital workflow. We're going to really figure out the best, most efficient way to integrate the two of them."

Recyclers and paper manufacturers both point to an increase in single-stream recycling collection as one reason the 2010 numbers may have wobbled.

TOXIC EMISSIONS

AN UNHEALTHY RISE IN HAZARDOUS MATERIALS

Pounds of emissions per thousand dollars of GDP



Source: US Environmental Protection Agency

What We Found: Toxic emissions are on the rise, and without regulatory action, they seem unlikely to abate in the year ahead.

What We Measured: Total emissions to air, soil, and water of toxic substances measured by the US Environmental Protection Agency's Toxics Release Inventory increased 4 percent from 2009 to 2010 after declining steadily from 2005 to 2009.

Why It Matters: The EPA tracks only a fraction of the country's toxic emissions, but the inventory provides a snapshot both of how regulations are affecting emissions and of what businesses are doing about emissions voluntarily.

What We're Seeing: Despite the mild progress made via voluntary company programs and the pressure of activist groups, toxic emissions are on the rise, further bolstering arguments that voluntary actions are not enough and regulations need to get tougher.

With reform of the Toxic Substances Control Act (TSCA) still far off and attention focused on the economy, it's no real surprise toxic emissions increased in 2010, the most recent year for which data is available. According to the EPA, such increases can typically be traced to a few big polluters, and the 2010 increase is no exception. Emissions of lead, arsenic, and asbestos are responsible for the lion's share of the increase, due largely to the expansion of mining and manufacturing activities.

While an uptick in domestic manufacturing may be good for the economy, more steel manufacturing—particularly at US Steel's factory in Ecorse, Mich.—resulted in a large increase in asbestos emissions: That factory alone was responsible for 26 percent of asbestos emissions in 2010. Similarly, an increase in demand for fertilizers, pesticides and soil supplements was a boon to Honeywell's Agriculture Division, and also led its Geismar plant, in Louisiana, to release 650,184 pounds of arsenic—about half of the nation's arsenic emissions in 2010.

As we found in the Toxics in Manufacturing indicator (see page 78), the mining companies responsible for the year's increase in lead

and lead compound emissions (those mining for zinc and gold, primarily) are not likely to drop; indeed, these companies' operations are expanding.

Still, there are bright spots. Some companies, particularly in the apparel industry, are voluntarily phasing out toxic chemicals and keeping better track of emissions. Adidas, Nike, and Puma have committed to have zero hazardous discharges by 2020.

Unfortunately, self-awareness and voluntary action have proven to be weak drivers in a poorly regulated market.

What It Would Take: Regulations, and the authority to enforce them, continue to be a problem in the United States, particularly at the federal level. The perennially hamstrung EPA relies heavily on companies to self-report toxic emissions and, as the case of rampant pollution from a coal-processing plant in Tonawanda, N.Y., shows, not all companies can be trusted to play by the rules. In the absence of stronger regulations and the resources to enforce them, the public is increasingly stepping in to hold companies accountable, a tactic that has worked particularly well with companies that make consumer products.

What companies are often finding, however, is the need for better collaboration to find ways to reduce, eliminate, or replace toxics in their supply chains. The tech industry has done a reasonably good job of this, and now the apparel industry seems to be headed in that direction as well. In a widely circulated op-ed in *The Guardian*, Nike executive Hannah Jones wrote, "Designing the future demands a different action plan. It demands open-source sustainable innovation. It demands we build collaboration models at scale. It demands we learn to treat social and environmental issues as pre-competitive. It demands we direct flows of capital towards sustainable innovation. It demands that winning must be defined as our ability to deliver sustainable business models to the markets and that economic growth that is decoupled from scarce resources."

In China, watchdog groups are increasingly helping western companies, particularly those in the tech sector, to keep their suppliers honest. Apple was faced with negative media in 2011 when a local activist group revealed the subpar working conditions and illegal dumping of toxics at some of its China-based suppliers.

In China, watchdog groups are increasingly helping western companies, particularly those in the tech sector, to keep their suppliers honest.

"It is shocking," Ma Jun, director of Institute of Public and Environmental Affairs, the Beijing-based nonprofit organization at the center of the Apple story, said in 2011, referring to the wastewater, hazardous waste, and solid waste he has witnessed at IT plants. Information technology is not the virtual industry that people often envision, Ma said. "It's an actual industry with huge amounts of discharged pollution, including toxics and heavy metals."

Apple has said it is moving quickly to address the issue, but increasingly the suppliers themselves are feeling the pressure to improve voluntarily or lose out on both local support and foreign customers. Microsoft supplier KYE Systems was similarly outed in 2010 in an investigative report from local watchdog groups, and the company has since rolled out a comprehensive CSR program. As a result, KYE found itself not only able to attract better local talent, but better customers as well.

"All the effort that we spend on CSR causes higher costs, but it also distinguishes our factory from our competitors," says Terry Chen, deputy plant manager and CSR program coordinator for KYE Systems. "It helps us attract a better customer base."

STOPPING SUPPLY-CHAIN POLLUTION WHERE IT STARTS

By Michael Kobori, VP for Social and Environmental Sustainability, Levi Strauss & Co.

Our reputation as a company is our most valuable asset. That's why it's crucial that we put the health and safety of our consumers and workers as our highest priority. One of the ways we do that is to reduce the use of chemicals in our products, and thus any emissions related to their production, use, or disposal.

Restricted Substances. We have strict guidelines about the materials used by factories to create our products, to protect our workers and the environment. We were the first company in our industry to establish a Restricted Substance List identifying the chemicals we will not allow to be used in our products or in the production process due to their potential impact on consumers, workers, and the environment. In an effort to build sustainability deeper into our business, we are working to phase out two chemicals in particular from our production cycle, given their recognized or potential impact on the environment and natural ecosystems: alkylphenol ethoxylates (APEOs) and polyvinyl chloride (PVC).

Reducing Emissions Without Raising Prices. We have committed to the Better Cotton Initiative, and that's a commitment we made for a variety of reasons. Over 95 percent of our products are made with cotton, and cotton grown using Better Cotton techniques has been shown in pilot projects to use about one-third less water and one-third fewer pesticides. Farmers are also taught important labor standards including education on international standards on child labor and financial training to improve their long-term profitability. Perhaps most importantly, Better Cotton won't cost more for consumers. We know that consumers want to buy sustainable products, but they don't want to pay more. This is a chance to change how cotton is grown without raising prices.

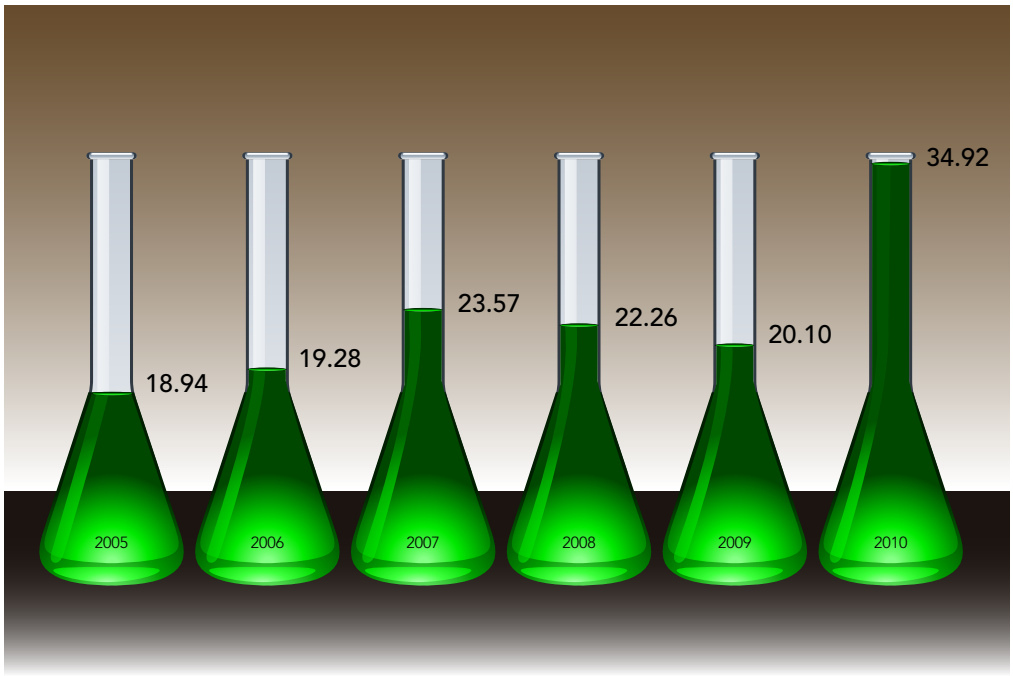
Sustainability in a Vacuum. In the apparel industry there is a general lack of agreed-upon base metrics, and that makes it difficult to address sustainability. When you are trying to reduce the amount of energy or chemicals or water either used in a product or emitted in the process of manufacturing that product, it's important to know the baseline of what you're starting with. Many of these facts and figures are disputed in the retail industry—or in some cases, the data doesn't exist at all. We have had to start measuring all of these things from ground zero with each manufacturer. We want to add what we've found to the industry conversation so that consumers are ultimately able to compare the sustainability of one product to another.

Beginning at the End. The single most important piece of advice I give to other companies looking to reduce both emissions and the use of resources in their supply chain is this: Do a life-cycle assessment. Our sustainability strategy is based on a product life-cycle assessment of the environmental impact of two of our most iconic products—a pair of Levi's 501 jeans and Dockers Original Khakis. The study examined all environmental impacts, including their impact on climate, energy, water, materials, land use, and biodiversity. It clearly showed us that the greatest opportunities for reducing environmental impact exist at the beginning and end of the product's life cycle: in cotton production and customer use. What we found out surprised us and guides our strategy.

TOXICS IN MANUFACTURING

A BIG JUMP IN THE USE OF CHEMICALS OF CONCERN

Tons of selected toxic chemicals used per billion dollars of GDP



Source: US Environmental Protection Agency

What We Found: A variety of factors, largely related to economic and technology shifts, led to a huge increase in toxic emissions from manufacturing in 2010. This trend isn't likely to reverse in 2011, either.

What We Measured: Total emissions to air, soil, and water of 27 chemicals that are most prevalent in manufacturing EPA's Toxics Release Inventory) increased a whopping 78 percent from 2009 to 2010, attributed primarily to much larger releases of lead, arsenic, and asbestos.

Why It Matters: Energy and climate change issues can often take center stage in discussion of business environmental impact, but toxics have real, immediate impacts on physical environments and human communities. Business attention to such issues has been on the rise since the 1970s, but recent softening of regulation has undercut years of improvement.

What We're Seeing: After trending downward from 2007 to 2009, manufacturing-related toxic emissions spiked in 2010, due primarily to increases in mining zinc and gold, as well as an increase in domestic steel manufacturing. Gold continues to be priced at an all-time high, and with the economy still struggling, that record price shows no sign of dropping, which means gold mining companies will continue to expand their operations.

Lead emissions were up in 2010 as a result of increased zinc mining. Mining companies globally are looking to extract more zinc from existing mines, as a zinc shortage is predicted to hit between 2012 and 2016. In the United States, the Red Dog Mine, in Alaska, was particularly active, expanding its territory and ramping up both exploration and extraction, resulting in nearly 320 million pounds of lead emissions (about 55 percent of the total 585 million pounds).

In more positive news, emissions of mercury compounds, isodrin, and dimethyl phthalate all decreased in 2010, a turnaround largely attributed to a combination of bad press around these chemicals and the work of several companies that are beginning to embrace the idea of green chemistry. Emissions associated with trade secret chemicals also decreased in 2010. Nonprofit groups like the Campaign for Safe Cosmetics and the Environmental Working Group have successfully pushed for more transparency from companies producing consumer products.

Those companies leading the green chemistry trend are reacting not only to consumer pressure, but also to market demand. Richard Liroff, executive director of the Investor Environmental Health Network, pinpoints three principal drivers of green chemistry: chemical laws in Europe (such as REACH and RoHS), which have prompted Apple and other companies to encourage their suppliers to move away from halogenated chemicals (e.g., bromine- and chlorine-based chemicals); state-level regulations in the United States, which have recently been tightened in the absence of strong federal regulation of chemicals; and rising customer demand for green chemicals.

Nike recently announced its preference for green chemicals and released a Restricted Substances List to suppliers, and Staples also recently developed a list of Bad Actor Chemicals for its suppliers. An association of group purchasing organizations in the health care sector, with buying power estimated at roughly $20 billion, recently developed a questionnaire for suppliers that focused on various sustainability questions, including the presence or absence of specific chemicals of concern.

What to Watch:

- **BizNGO Working Group on Safer Chemicals.** Comprised of private companies and NGOs, the group is spearheading voluntary chemical reform. In 2011, it released two tools for use by companies looking to reduce their use of concerning chemicals—the Principles for Sustainable Plastics and the Chemical Alternatives Assessment Protocol. Look for new policies from its member companies to reduce manufacturing-related emissions, and new tools to help other companies follow suit.

- **TSCA Reform.** Environmental and health groups have been pushing the government to reform its Toxic Substances Control Act for years. (It was last updated over 30 years ago). This may just be the year it happens, particularly with large companies such as Dow and BASF backing reform. If it becomes a hot partisan issue, which it could, expect to see it punted to post-election years.

- **Nyrstar, Xstrata, Teck, Hindustan Zinc, and Glencore.** These mining companies are quietly ramping up exploration and extraction of zinc in anticipation of a coming shortage, as demand increases and supplies level off. Teck is currently expanding its Red Dog Mine, in Alaska, into the adjacent Aqqaluk deposit to eke 12 more years out of that resource. The only untapped large stores of zinc are in Iran, Namibia, and the Yukon territory. Given the instability of Iran and the fact that the supply in Namibia has already been bought up by Hindustan Zinc, expect to see a race to develop the Selwyn deposit in Yukon Territory—and a corresponding increase in North American lead emissions.

Companies leading the green chemistry trend are reacting not only to consumer pressure, but also to market demand.

FINDING NEW MARKETS FOR GREEN CHEMISTRY

By Howard Williams, Vice President, Construction Specialties

Construction Specialties is a supplier of materials in the commercial and industrial construction space. Since 2004, it has been working to remove chemicals of concern from its materials, starting with PVC before moving on to the EPA's list of Persistent, Bioaccumulative and Toxic Chemicals (PBTs) and neurotoxins. According to Vice President Howard Williams, the approach has not only resulted in better products, but also in better profits.

Business Benefit. The marketplace is moving toward green chemistry, and we have customers that have certain requirements for the materials they purchase. We have a contract with Kaiser Permanente, for example, that's worth a substantial amount of money annually, and if we did not have the sort of chemical policy we have in place we would not have gotten that contract.

Since the 1990s, demand for eco-friendly products has gone from essentially nothing to about 87 percent of customers. And not only did we start hearing this demand from our customers, but we also worked with NGOs to get a sense of where the market is heading. The industry groups, on the other hand, tend to be much more protective of largely capitalized infrastructures and not open to change.

Trade Groups Don't Buy Products, Customers Do. In 2004 and 2005, when we were first beginning to rethink our chemical policy, we actually discussed whether we should listen to our customers or to what industry groups were saying. It didn't take us long to figure out that industry groups don't buy products, but customers do.

At the time, our customers were interested in getting PVC out of products. We do so much work with healthcare, and that industry in particular had seen a lot of research on flexible PVC showing that phthalates were bad for human health. So we started with PVC, and then we moved beyond that to look at removing all PBTs, and now we're screening for neurotoxins and endocrine disruptors. Every time we finish one task, we see more areas for improvement.

The trade groups would have us believe that looking for safe alternatives to chemicals of concern is a very, very difficult process. But while it is sometimes frustrating and sometimes expensive, the marketplace has continued to reward the effort.

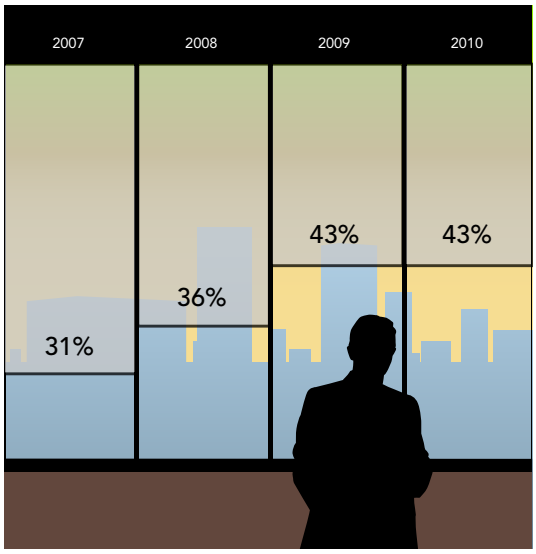
Green Chemistry For All. I'm a conservative Republican, and in environmental circles it's almost like, "Who let you in the door?" But safe chemistry is not a political issue, it's a people issue. And when I talk about this stuff with my equally conservative friends they say, "You're right, we need to do better." We've all been touched by cancer, or infertility issues, or asthma—all of these issues seem to be on the rise, and I don't think it's because we're devolving, I think it's because something has happened. Even if the science out there about these chemicals is 50 percent wrong or even 75 percent wrong, which I don't think it is, it still makes sense be on the safe side. The common sense is so apparent to so many people.

That's why I think the market for green chemistry will only continue to grow. At the end of the day, consumer demand is a stronger force than an industry's will or legislation, and given that consumers are asking for safer alternatives, that's where the market is headed.

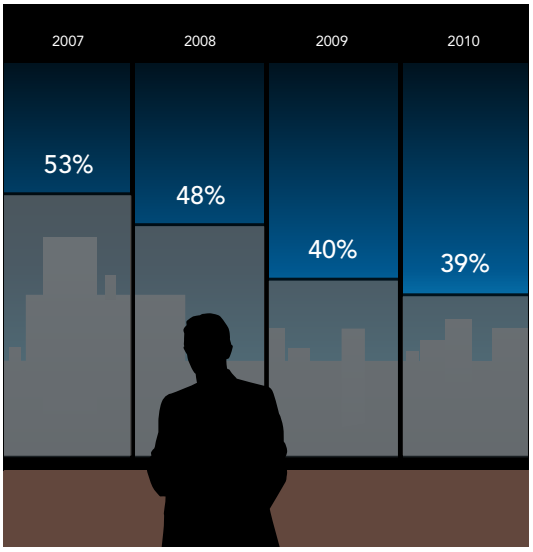
TRANSPARENCY

DISCLOSURE RATES ARE SLOWING DOWN

Disclosure of Material Environmental Impacts (percentage)



MSCI World Companies Not Disclosing Impacts (percentage)



Source: Trucost

What We Found: The disclosure of the environmental impacts of the 1,600 companies in the MSCI World index was stagnant, staying virtually the same in FY2010 as in FY2009.

What We Measured: The percent of companies' total environmental impacts that they disclose, as measured and assesed by Trucost. Each year, Trucost tracks more than 700 environmental impacts of more than 4,000 companies—such things as greenhouse gases, emissions contributing to smog or acid rain, solid waste, water use and emissions, resource mining and consumption, and natural resource use. This indicator looks at a susbset—the 1,600 companies contained in the MSCI World Index. The information is used, among other things, to assess the environmental financial impacts of each company—how much their operations are costing the earth (see page 51).

To make its calculations, Trucost combs companies' environmental reports and other disclosures or seeks such information directly from companies. When information is not available, Trucost fills in the missing information using "granular benchmarking calculation of environmental impacts from each company's business operations." It then applies a financial cost to each. The total value or cost of the impacts disclosed by companies are normalized by the total environmental impacts of the companies, both disclosed and estimated.

Trucost also tracks the number of companies that do not disclose any environmental impact data. That number is divided by the total number of companies to calculate the percent of non-disclosers.

For the 1,600 companies in the MSCI World Index, the percent of the total environmental footprint disclosed remained unchanged at 43 percent The percent of nondisclosing companies improved very slightly, from 40 percent in fiscal year 2009 to 39 percent for fiscal year 2010. (Higher numbers are better for disclosure rates; lower numbers are better for

nondisclosure rates.)

Why It Matters: This metric highlights how well companies understand their environmental impacts, which is strongly correlated with their ability to manage those impacts. With greater understanding come greater opportunities for cost savings, innovation, and risk reduction. Increased transparency also benefits customers, regulators, and others who want to know what a company is doing to address its environmental impacts, and how well it's doing it.

What We're Seeing: Overall, after years of improvement, companies' disclosure of their environmental impacts has flatlined. It's not a good sign. Disclosure and transparency are keys to progress. If companies aren't signaling that they understand and are addressing their impacts by reporting in a systematic way, it doesn't bode well for their making informed decisions on how to reduce those impacts.

"What that means is that, by our calculations, more than 57 percent of all the greenhouse gases, 57 percent of all the water impacts, are unrecognized by companies," explains James Salo, Senior Vice President, Strategy and Research at Trucost. "Is that good or bad? If you're talking about being able to make intelligent decisions, then they're not going to be able to do anything about it."

Some sectors are doing better than others. Three sectors had modest improvement in disclosure: telecommunications (up 4 percent), technology (up 5 percent), and financial services (up 6 percent). However, in the case of the financial services sector, there still is a long way to go; at 27 percent disclosure, it is the second-most-secretive sector, after real estate.

Utilities actually disclosed less environmental impact information in FY2010 than they did in FY2009, though the sector maintains the highest overall disclosure of environmental impacts (75 percent), likely due to the long-standing regulations placed on this industry, requiring utilities to disclose a great deal of information.

What's Next: Transparency continues to be of high interest among a growing number of parties—not the least of which are institutional investors, who view the kinds of data Trucost and others compile as a means of risk mitigation in a world of resource uncertainty and climate concerns. The challenge, of course, is how to bring on board the next wave of companies—the ones not naturally inclined to be seen as leaders, or who aren't under intense scrutiny by customers, activists, regulators, or shareholders.

Should it be carrots or sticks? Both seem to be effective. For example, business and institutional customers have significant ability to leverage their buying power to spur reluctant or recalcitrant companies to provide more transparency. Some are incorporating transparency into their procurement or RFP decisions. Some public agencies are doing this, too.

Of course, to the extent that transparency becomes a consumer issue, it will drive change even faster. According to the Eco Pulse 2011 survey conducted by The Shelton Group, corporate reputation surged into third place as a criteria for deciding if a product is green. (In other words, "I need to believe the company is green before I'll believe the product is green.") More than half of Americans, 52 percent, said it was important. This audience includes not just potential consumers, but also future employees.

One barrier to transparency is the lack of standardization of this information. Each research firm, company procurement department, and government agency has the potential to seek different information or ask the same questions in slightly different ways. That's another challenge to simplifying disclosure for companies.

"What this means is that 57 percent of all the greenhouse gases and 57 percent of of all the water emissions, are unrecognized by companies," says Trucost's James Salo.

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