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Special Report

GREENING THE SUPPLY CHAIN: BEST PRACTICES AND FUTURE TRENDS



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Critical Issues in Greening the Supply Chain

The more corporations around the globe focus on sustainability, the more they realize that their greatest challenges and opportunities often lie outside their own offices and manufacturing plants. To make a truly significant lifecycle leap, large companies have to work on greening their supply chains.

Recognizing this, Wharton's Initiative for Global Environmental Leadership (IGEL) devoted its 2012 annual conference to "Greening the Supply Chain: Best Business Practices and Future Trends." Attended by noted academics and professionals, the April 26 conference covered a broad range of topics.

This special report, a collaboration between IGEL and Knowledge@Wharton, zeroes in on four of the most pressing issues in the field, using information from the conference, as well as additional interviews and research.

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Underlying the relatively easy steps some companies are taking to green their supply chains are a few core principles. These best practices can accomplish a great deal of good for the environment in the near term. But, sooner rather than later, executives will have to look beyond the low-hanging fruit and find long-term solutions to make companies truly sustainable.

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For some companies, it's easier to write an optimistic sustainability report than it is to thoroughly green its operations and those of its suppliers. Obstacles include consumer unwillingness to pay a premium for environmentally friendly products, the complexity of modern supply chains and the huge capital investment often required. But increasingly, strong regulation, real opportunities to save money by reducing waste and the need to maintain a positive brand image are pushing corporations to thoroughly revamp their operations.



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Many of the largest and best global corporations are still using spreadsheets to handle environmental data. To make their supply chains truly sustainable, companies need information systems that merge environmental and economic data, and make the results available to all stakeholders within and outside the company. The challenge is daunting, but progress is being made on many fronts.

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Transportation is only an estimated 4% of the global supply chain, but it's one of the ripest areas for reform. Combining trips, switching to alternative fuels and fuel-efficient shipping, reducing wasteful product returns, and reusing material rather than sending it to landfills are just a few of the options available. Savvy companies are setting ambitious energy use and greenhouse gas reduction targets.



Managing Green Supply Chains: Best Practices and Long-term Solutions

One inescapable fact dominated the discussion at a recent conference organized by the Initiative for Global Environmental Leadership at Penn/Wharton (IGEL) entitled, “Greening the Supply Chain: Best Business Practices and Future Trends.” As much as customers value sustainability, very few are willing to pay more for it, at least right now. Study after study (as detailed elsewhere in this report) has confirmed this conclusion, which explains why the focus of several of the conference presentations was about how to green supply chains *and* cut costs.

According to Rajat Kapur, project manager of “ecomagination” at General Electric (GE), despite the widespread perception that companies have to choose between what is good for the environment and what is good for the bottom line, GE believes this is a “false choice” and that companies can do both. Several other speakers and supply chain experts interviewed for this report shared this perspective and offered a wealth of ideas and approaches that have allowed their companies to do good and do well.

But will what’s best for the environment always be in the best financial interest of companies? Many are skeptical, including Eric W. Orts, faculty director of IGEL and a Wharton legal studies and business ethics professor. Orts pointed out that most academics think “there are often costs associated with environmentally responsible choices. It is cheaper if you can externalize pollution to somebody else, and then it doesn’t come into your product cycle. That way, you don’t have to account for it in the supply chain.”

One reason for this skepticism is that the relatively easy, short-term steps companies are now

taking, as beneficial as they may be — installing more on-off switches and valves, reducing the distances products travel to market, using rather than losing excess heat generated during manufacturing — are not enough to carry the day. Robert Giegengack, a professor emeritus at the University of Pennsylvania’s department of earth and environmental science, made the point early on in the conference: “We are congratulating ourselves that we are becoming more sustainable,” he said, “but we are not. We are becoming less unsustainable. And we’ll begin to approach the question of global sustainability when we carry this discussion back to the beginning of the supply chain, because in every case but two [water and oxygen], we are extracting natural resources at rates that far exceed the rate at which they are being replenished.”

Despite the widespread perception that companies have to choose between what is good for the environment and what is good for the bottom line, companies can do both.

These twin themes — the good work companies are doing right now and the need to address much more difficult, longer-term solutions — run throughout the discussion of how best to manage green supply chains.

Current Best Practices

Underlying the generally painless and often profitable steps companies are taking to green their supply chains are a few core principles.

Choose the right suppliers: One of the most obvious first steps to take is to choose the most environmentally responsible suppliers. Yet, even this seemingly simple task means different things in different industries and is approached by companies in a variety of ways.

When it came time for Walmart to roll out its environmental initiative, said Edwin Keh, former COO and senior vice president of Walmart global procurement, and now a lecturer at Wharton, the company sent a letter to a thousand CEOs of major suppliers in China. In essence, the letter said, “We’re having a meeting in Beijing. Show up.” When they arrived, the CEOs were told that half of them would be getting more business from Walmart and the other half would no longer be doing any business at all with the retail giant. Walmart’s new environmental rules were then handed out and the CEOs were told to make sure they figured out how to end up in the winning half.

That’s one way to approach the selection of suppliers. But Tim Riordan, vice president of supply chain for Interface, a pioneering carpet company, noted that “We’re not Walmart. We’re a middle market company ... so we need to be having a conversation with our suppliers at a completely different level, which is around trying to drive value, trying to drive product performance, trying to innovate, to differentiate.”

While less confrontational towards suppliers than Walmart, Riordan said that Interface does “speak with our wallet.” One key supplier that did not step up as much as Interface expected lost a good deal of business over the last approximately six years, said Riordan, dropping from 50% or 60% of Interface’s supply chain to less than 10% now.

But in general, Interface relies less on turning away unhelpful suppliers than it does on attracting helpful ones. “Interface does have a reputation for being innovative,” said Riordan, “and because of that, I think we’re getting a competitive advantage. A lot of suppliers, either incumbent or prospective companies, are coming to us with technology that they feel can work for us.”

The company also uses its request for proposals (RFP) process to good effect, including very

specific questions as part of its selection criteria — everything from “What’s your carbon-neutral strategy?” to “We’re looking to lower our carbon footprint in transportation. What tools do you have that you can provide to us?” Riordan noted that the formality of the RFP process often helps even long-term suppliers break free of their routine operations, take a fresh look, and come back with new ideas they never thought to use before.

For International Paper (IP), the challenge is less about choosing suppliers than it is about ensuring that suppliers provide wood fiber from sustainable sources. There are three types of fiber that meet this standard, according to James McDonald, manager of sustainability at IP. The first, roughly 30% of IP’s global supply, comes from forests certified by one of several third-party organizations. While there is some controversy over the relative merits of specific forest certification programs, IP views all of them as valuable. As Dave Kiser, IP’s vice president for environment, health, safety and sustainability, said at the IGEL conference, “The key is to work with the certification agencies rather than starting to get into arguments around differentiating very subtle differences between the approaches of the different certification bodies.”

Unfortunately, many small landowners in North America and elsewhere are not willing to go through the certification process. To deal with these uncertified forests, IP has developed, as its second source of acceptable fiber, a Certified Procurement System. This ensures that only environmentally trained loggers contribute to the company’s supply chain and that small landowners are educated in sustainable forestry management.

The third acceptable source of fiber is from recycled paper products. While appealing environmentally, this source is limited by the availability of recycled fiber, the market for recycled paper products and the relative benefits (or downsides) of recycling in specific situations. There are times when recycling is not the best environmental choice.

Put your effort where it will do the most good: Large corporations often have tens of thousands of suppliers. So in one form or another, most companies use a version of what has been called the 80/20 Rule to decide where to focus their efforts. Before rolling out its energy-saving program, for example, Walmart began by pulling together its top 200 suppliers in China in 2008, which, Keh explained, constitute 60% to 80% of its total supply chain. The company then worked with these

suppliers to develop best practices that could be used with everybody else. (If the suppliers needed help, Walmart had energy-efficiency consulting companies lend a hand.)

GE takes a slightly different approach. Instead of focusing on the relatively few suppliers who represent the bulk of the company's supply chain, Kapur said, GE uses life-cycle analysis (LCA) tools to identify the areas of greatest potential. These LCA tools help GE "prioritize ... to figure out which products within GE and which suppliers may be the best target to go after [to achieve] the biggest environmental impact."

Successful smaller companies tend to avoid this kind of detailed analysis, fearing "paralysis by analysis." According to Allen Hershkowitz, senior scientist at the National Resources Defense Council (NRDC), it is best for companies to create teams of "people who have legitimacy in the organization, in operations and procurement ... people who have been there a long time, but who buy into the environmental vision." These teams, he suggested, "cultivate buy-in from the organization more broadly."

It is also important, said Hershkowitz, to garner some early wins in order to start gaining momentum. This means plucking that low-hanging fruit and, surprisingly, not focusing too much on goals right at the outset. "We go easy on the goals because we don't want people to feel intimidated or overwhelmed."

Collaborate to innovate: Many companies engage their suppliers in the greening process. Both GE and IBM, for instance, have collaborated with their supply chain partners to come up with environmental guidelines and innovative approaches to environmental challenges. Few companies, however, have integrated collaborative innovation as thoroughly as Interface.

In some cases, suppliers come to the company with new ideas that they think Interface will value. Knowing that Interface was grinding up whole carpets to recycle the polyvinyl chloride (PVC) backing, for example, an Italian company brought Interface a technology that allowed it to separate the PVC base fiber from old rugs. This improved the purity of the recyclable PVC. It also left Interface with a quantity of Nylon 66 fluff that had always been considered unrecyclable. But Interface worked with yet another supplier over several years to develop a method of recycling the nylon fluff to be

reused either in its own products or in the products of other companies in other industries. "Those are innovations that have been pretty critical to our success," said Riordan.

In other cases, Interface convenes a Supplier Summit, a one-on-one meeting with key suppliers, to help tackle specific challenges. To keep the discussion focused on practical, often technical issues, the Summit does not get going until the sales and purchasing teams are out of the room. That allows all the operations people to meet together and, separately, all of the R&D people to meet as well. These summits have generated many useful solutions, including a bio-based binder that Interface pioneered.

Use suppliers as force multipliers: With considerable experience operating its own global environmental management system (EMS), IBM rolled out its Social & Environmental Management System program to its 28,000 first-tier suppliers in 2010. The program requires companies to deploy and sustain a corporate responsibility and environmental management system, which includes objective measures of their performance against stated environmental goals.

What makes this program so potentially powerful are two additional requirements: Suppliers must publicly disclose their metrics and results, and "cascade" the program to any suppliers that are material to IBM's products. These two requirements, said Louis Ferretti, director of environmental compliance at IBM's integrated supply chain, are "clearing a major step forward in driving the industry to a high level of performance."

"Transparency is a very powerful tool," stated Andrew Winston, co-author of *Green to Gold* and *Green Recovery*. The new openness that IBM is requiring will "encourage improved performance like no other incentive," he writes in his blog. Even more importantly, "The fourth component, 'cascading,' means that IBM's requirements will ripple up the supply chain. Businesses will move a step closer to the holy grail of environmental measurement — knowing the footprint of every product without conducting a costly and time-consuming lifecycle analysis."

Other companies are adopting similar cascading approaches. Charlene Wall-Warren, North American sustainability manager for BASF Corp., told conference attendees about her company's "1+3 Program" in China, which asks suppliers to engage

three of their own business partners in the program so that BASF's efforts can spread more rapidly.

The elephant in the room is compliance: Of course, many of these best practices are only as good as their execution, which raises the thorny issue of compliance and enforcement.

As Charles Howland, senior assistant regional counsel for the Environmental Protection Agency (EPA), said during the conference, "The only way that you can ensure that your supplier is green, by whatever standards you set, is your own people in the field doing enforcement the way the government here does under U.S. laws." Others at the conference also raised questions about enforcement and compliance, mentioning among other examples, Apple's apparent inability to enforce its own high standards at Foxconn in China.

Kapur said GE deals quickly and decisively with any infractions of its rules, and Keh spoke about combating corruption in China by firing more Walmart employees than anyone in the firm's history (while recognizing that Walmart may not have acted as effectively in overseeing its Latin American operations). While laudable, these and similar efforts do not diminish the overall challenge facing well-intentioned corporations. Jeff Smoller, of the Wisconsin Department of Natural Resources, spoke for many at the conference when he said, "There's an elephant in the room ... and it's the enforcement and compliance element on a national and international basis."

Long-term Solutions

Even with the best enforcement, all these efforts still represent what Giegengack and others referred to as low-hanging fruit, which begs the question, what happens once all the low-hanging fruit has been harvested?

Two paths towards long-term solutions were suggested by conference speakers.

Closed-loop supply chain: Dan Guide, professor of operations and supply chain management at Penn State, sees the ultimate problem as our consumer culture, which is based on disposable goods. Things were different during the Great Depression and World War II, when people were zealously saving, reusing and recycling everything from food to rubber. And many people around the world still see western consumerism as shockingly wasteful (one conference participant born in Vietnam spoke

with amazement about how many useful objects consumers throw out in the U.S.).

But years of increasingly sophisticated and widespread advertising have trained us, said Guide, to believe that the newest product is always the best. This bias is so ingrained that when Guide asked his students what one word they most equated with "green," the majority chose the word "new." Noting that most of the energy and natural resources associated with a product are consumed during the production phase, when new products are created from raw materials, Guide calls this craving for newness "unsustainable." The problem, in his view, is found in our "make-use-dispose" business model.

The solution Guide proposes is a completely new business model based on the concept of a closed-loop supply chain. Xerox, said Guide, "is the poster child" for this approach, which he calls "servicizing." "Xerox doesn't sell their machines to companies," he explains. "They lease them, and they maintain and service them. So they know exactly what condition that product is in at all times." And when they get it back at the end, they have gained enormously valuable feedback about how the product performs in the field. Using this information, they can then re-use parts from the machines they recover and remanufacture products that are more valuable to customers and far less expensive to produce.

While Guide points out that remanufacturing is incredibly profitable, and that Xerox and others are enjoying great success with this business model on the B2B side, he readily admits that the same is not true for products sold to consumers. One challenge is that in order to make the remanufacturing of products efficient, the products need to be initially designed and engineered to have modular parts, some of which can be efficiently recycled, others of which are designed to be durable enough for multiple uses. That's easy enough, he said.

The hard part is that consumers do not want re-manufactured products; they want new ones. Changing that mindset, conference participants said, will lead to a dramatic change in consumer culture. Guide thinks that marketing, which created the current culture, is a powerful tool for that change. Once the public is sold on the idea of frugality (as happened during World War II), people will once again value performance over novelty, substance over fashion and long-term quality over disposability.

Targeted government action: Ruben Lobel, a professor of operations and information management at Wharton, puts his faith in new green technologies, which he thinks are inevitable, but likely to be slow in arriving. Rather than risk waiting for these new technologies to develop, he believes we should use government action to accelerate the process.

Based on his research, Lobel advocates combining the carrot of intelligently designed subsidies with the stick of effective regulations. On the one hand, subsidies can help create the manufacturing and consumer base new technologies need to take off and become self-sustaining. The subsidies give these new green technology companies the ability to stay in business, producing more and more of what they sell, and learning in the process how to produce it both more effectively and less expensively. This is what Lobel calls “the learning-by-doing effect.”

On the consumer side, subsidies encourage more people to use new technologies, which makes more people aware of and comfortable with the new systems, creating a positive feedback loop that helps grow the consumer base. Lobel calls this phenomenon “technology diffusion.” Whatever you call it, the result is greater production and increasing economies of scale.

For subsidies to be effective, however, Lobel’s research shows that they must be consistent and intelligently designed. Governments that do not model the effects of various subsidy levels before settling on an amount and that make frequent small changes in response to changing market conditions, however well intentioned, are unlikely to accomplish policy goals, Lobel’s research shows.

Sometimes set subsidies are applied to an entire industry, rather than varying according to purchase price. (Federal tax credits for electric cars are an example, Lobel said.) Only by establishing subsidies that are properly structured to motivate the desired behavior, and keeping the subsidies constant enough that people are willing to make long-term decisions based on them, can government create incentives that effectively move consumers, manufacturers and investors.

As for regulations, Lobel pointed out that companies are currently free to engage in economic activity that harms the environment and other people without suffering any negative consequences. Essentially, they create the negative externalities Orts was alluding to, forcing taxpayers or others to bear the ultimate cost of their actions. Legislation, said Lobel, can force companies to pay for the environmental damage they cause, which in turn provides a strong financial incentive for them to change their behavior.

Whether cultural changes, government action or growing scarcity helps us become a truly sustainable society — or more likely some combination of all three — there is no reason to neglect the low-hanging fruit that still abounds. As Keh told conference participants, the actions companies are taking now to green their supply chains “buys time for the technology, for the legislation, for the cultural changes that need to take place for good to happen.” A number of participants agreed also that new research and business planning should focus on developing effective frameworks for long-term solutions to current environmental problems: tackling the taller trees in the forest beyond the low-hanging fruit. ♻️



BUMP

Walking the Talk: Speed Bumps on the Road to Green

No company sets out to lose money by going green, and there's ample evidence that reining in waste can have substantial material benefits to the bottom line. At the same time, switching to a sustainable path also means significant capital investment, and especially in an uncertain regulatory climate, that can be a deal breaker.

These were some of the ideas tackled at a recent conference hosted by the Initiative for Global Environmental Leadership at Penn/Wharton (IGEL) entitled, "Greening the Supply Chain: Best Business Practices and Future Trends."

Consumers are fickle partners, often unwilling to pay for what they say they value. But since a green aura enhances brand image, every company talks about it. There are other significant drivers as well, including an increasingly demanding regulatory environment. Taken together, these factors add up to the prevailing argument among corporate boards that environmental spending, however painful, has to go beyond window dressing. To get a true measure of sustainability, however, it's necessary to separate rhetoric from reality.

Consumers are fickle partners, often unwilling to pay for what they say they value.

Howard Kunreuther, Wharton operations and information management professor, noted that, despite what companies may say publicly, when it comes to dealing with suppliers, myopia is a constant challenge. "The supply chain requires long-term investments, and there is a focus on

short-term returns. The term 'NIMTOF,' or 'not in my term of office,' is relevant, so we have to create incentives to deal with that issue."

And even well-intentioned companies often find that what seem like obvious "home runs" don't work. Dan Guide, professor of operations and supply chain management at Penn State, said at the conference that it's hard to make a business case for some environmental supply chain initiatives. In many cases, he suggested, recycling, "is a sucker bet," especially when it comes to plastic. "The recycled plastic in park benches is more expensive as a source material than virgin timber. And contamination is an issue. If plastic from cell phones is 98% pure, buyers will want to know what's in the other 2%." The complex nature of modern products such as cell phones, which contain many different materials tightly bound together, is one reason, he said, that "reuse is kind of going away."

When it comes to the supply chain, it's not easy being green. But companies are increasingly driven to do it. After all, it's the law. According to CSC's Stephen Bogart, "we are living in an increasingly regulated world. Regulations are affecting businesses everywhere, which is one reason we have designed 200 new business processes. We have to provide assurances that materials can be sold safely in your country, but also shipped around the world."

Walmart's Long Road

In 2009, Walmart, the world's largest retailer, sent a questionnaire to its 100,000 suppliers asking such questions as "Have you measured your corporate greenhouse gas emissions?" and "Have you set publicly available waste reduction targets?"

As part of the company's Sustainability Index, Version 1.0, Walmart said it expected its suppliers

to achieve three daunting goals: Achieving zero waste (also known as “nil to landfill”), using 100% renewable energy, and producing sustainable products. By 2015, Walmart pledged to reduce global supplier-sourced greenhouse gas emissions by 20 million metric tons. It was, the retail giant said, not only a challenge, but also a “tremendous business opportunity.”

More than most, and despite the many difficulties, Walmart walks the talk. A company that used to spend \$15 million a year hauling its plastic waste to landfills now makes \$28 million in the same period by pelletizing that waste and selling it back to packaging suppliers. But the company is perhaps best known for its low prices, which it maintains by scrupulously — some would say ruthlessly — controlling supplier costs. While Walmart’s suppliers will see impressive results from cutting waste, will they be able, at least in the short term, to incorporate environmental reforms and also meet the company’s continuing price targets?

Supply chain reform is a two-way process, and Walmart deserves credit for changing some of its longstanding practices — such as giving suppliers only short-term contracts — to foster the change it seeks. In 2006, for instance, organic cotton farmers got a verbal five-year purchasing commitment from Walmart, assuring them that their investments in sustainable production were justified.

In 2008, as it held a sustainability summit for its Chinese suppliers, Walmart also introduced a new set of social standards aimed at working conditions. By 2012, for instance, suppliers had to secure 95% of their own materials from factories with high audited scores in both environmental and social performance. Child and forced labor were banned, as was sub-minimum-wage pay. It was a strong answer to critics who said that the company had been lax in protecting its workers from sub-standard conditions.

Walmart’s relationship with its suppliers is deepening, said former Walmart COO Edwin Keh. “There used to be three things that Walmart wanted from its suppliers — price, price and price,” he said. “If someone offered the same product for a nickel less, we would go across the street and buy from a competitor. But now it’s more of a long-term relationship, and Walmart has skin in the game.”

When the Guidelines Fail

Yet the mere drafting of cutting-edge mandates does not itself ensure they will be observed throughout

the supply chain. Apple, a major employer in China, also had a Code of Conduct for its workers, but it failed to prevent the crisis that gripped the company in March 2012 when it was revealed that one of its biggest suppliers, Foxconn Technology, forced some of its employees to work more than 60-hour weeks and as many as 11 days in a row, sometimes under hazardous conditions. According to a Fair Labor Association (FLA) report, nearly two-thirds of Foxconn employees said their pay failed to “meet their basic needs.”

In a statement, Apple said that its team “had been working for years to educate workers, improve conditions and make Apple’s supply chain a model for the industry.” It joined FLA and asked it to conduct the audit that led to the devastating findings, but some noted that the company had been there before.

In fact, in 2006 Apple said that Foxconn (which makes 40% of electronic products worldwide and has 1.2 million workers) had “enacted a policy change to enforce the weekly overtime limits set by our Code of Conduct.” And in 2011, when the company conducted 229 audits (up from just 39 in 2007), it said reducing overtime was a “top priority.” Still, the 2012 progress report on supplier responsibility found that, at 93 companies, more than 50% of employees worked more than 60-hour work weeks, violating the Code of Conduct.

Walmart, too, faced embarrassing revelations in 2012, when a *New York Times* investigation indicated a pattern of its Mexican subsidiary paying bribes to expedite new store construction. Faced with evidence of such payments, Walmart had earlier conducted a cursory internal investigation that led to no action being taken. The headlines tarnished Walmart’s sincere efforts to incorporate sustainability into every facet of its business, especially the supply chain.

It is, of course, hard to quantify the business costs of these embarrassing mistakes, but for companies working hard to burnish their brands, years of hard work can be undone. Clear leadership will help avoid that pitfall. Eric W. Orts, faculty director of IGEL, and Wharton legal studies and business ethics professor, said it can be tempting for companies to violate their own internal codes — on working conditions and hazardous emissions, for example — as a routine cost of doing business abroad, with no likely consequences. “Companies have to make basic choices,” he said. “Pollution issues have to be addressed on a higher level than just talking about

bottom-line costs. It's sometimes a choice between economics and the environment."

Transparency Counts

Building a green reputation takes time, and superficial efforts risk charges of "greenwashing." Radical transparency is a "challenge" for companies seeking sustainability, according to Natural Logic's Gil Friend. "There are a lot of noble efforts in trying to achieve transparent supply chains," he said. But there are a lot of challenges as well. "There is the challenge of confidential business information, and the data is often hard to get; it can be garbage in, garbage out." Inefficient data collection compounds these problems and adds costs. "In some cases," noted Friend, "you have senior vice presidents doing the collating, which makes no sense."

To help meet these challenges, Friend suggests that businesses think about a "web of goods," with every piece they move through a supply chain having a restricted-access, addressable URL. This gives you data that is both "open and protected at the same time. It's like a Zen koan."

Launching Data Networks

Taking just such an approach is Better Place, the American electric car battery-charging company headed by Israeli-born Shai Agassi. The company, which has raised \$750 million for an ambitious plan that combines vehicle sales with battery leasing, and battery swapping with a network of charge points, is working in Israel, Denmark, the Netherlands and the U.S., among other places. It also has ambitious plans to wire China.

Better Place sets up data centers to intensively monitor each transaction in real time, tracing its electric cars as they charge and swap batteries. The aim is to both ensure a good customer experience and create an electronic record that will enable rapid tracing of faults and a quick response to problems, including those that come from suppliers.

Better Place has a high-level web of suppliers that includes major companies such as Intel and Microsoft, but also smaller firms like China's Flextronics, which produces its charging stations. Jenny Cohen-Derfler, a former Intel manager, now monitors supply chains as a Better Place global vice president. "Monitoring compliance can be a challenge, particularly when you're working in China," she said.

Better Place is well aware of Apple's problems in China, and as the company gears up, it is planning

to monitor its suppliers with regular quality audits. But Cohen-Derfler also said that there are limits to what her company can accomplish on its own. "We are doing business with international companies, and they're responsible for their own supply chains," she said. "We can't ask other companies to do our audits for us, but at the same time we're working with brands that have histories and track records. We have to trust them to a certain extent."

Rubicon Global, a sustainable waste and recycling company that emphasizes reducing costs by reusing materials instead of trucking them to the landfill, is taking sophisticated supply chain monitoring to an industry where record-keeping was in the Dark Ages. "Our consolidated billing and continued measurement optimizes efficiency gains," said Rubicon Global's Nate Morris.

The Natural Resources Defense Council (NRDC) is applying some of those same lessons to professional sports. According to Alice Henly, a research fellow there, "We started by setting up environmental data tracking, because few teams had tracked usage at their facilities. Today, Major League Baseball has a league-wide tracing system, launched in 2010, and it's being tested in real time right now."

Paying for Green

Companies want to believe that their sustainability investments will pay off, especially when they put R&D money into developing new green products. But according to Guide, new Penn State research casts doubt on the willingness of consumers to pay for green products or for altruism. "People in the 18- to 21-year-old age range equate green with new. They don't want to buy repurposed material," he said. "And when a brand of compact fluorescent bulbs was branded as the 'Earthsaver,' nobody wanted to buy it. But the same bulb renamed the 'Energy Miser' flew off the shelves. You just can't find evidence that people are willing to pay more for green."

A joint 2011 CoreNet Global and Jones Lang LaSalle survey found both bad and good news about spending for the environment. Although the percentage of corporate executives willing to pay more for green leased space jumped from 37% in 2009 to 50% in 2010, the same survey made clear that companies are looking for a quick payback. Some 57% think one to three years is an acceptable time for energy-efficiency gains to pay back their costs, but only 30% were happy with three-to-five-year paybacks, and just 9% want it to go longer than that.

A 2011 Nielsen Global Online Environment & Sustainability Survey found that 83% of respondents nod approvingly when asked if it's important for companies to green their businesses, but only 22% said they would actually pay more for a product that was eco-friendly. Interestingly enough, willingness to pay extra was highest in the Middle East and Africa (a third of those surveyed) and at a low in North America (only 12% willingness).

When London's Carbon Trust asked 18- to 25-year-olds in six countries about their opinion on climate change, some 68% said they would like to see companies independently certify their carbon footprints. But most participants in the same survey said they would buy products with low carbon loads only if they cost no more than the conventional version. China had the most apparent altruism, with 42% saying they would happily pay more for green products.

Actual experience sometimes affirms these impressions, because some green products have stumbled in the marketplace. Clorox, for instance, introduced Green Works cleaning products in 2008, complete with an endorsement from the Sierra Club. Walmart stocked the line, ensuring widespread distribution. Sales began well, with \$100 million in the first year (leading to some copycat products), but once the recent recession hit, those sales fell to \$60 million.

All is certainly not lost: In fact, green household products have held on to a fairly even 2% market share. That parallels hybrid cars, which also maintain a regular 2%-3% of the U.S. auto market. Obviously, retailers would like to see green products grow beyond a niche, even a dependable niche, but it hasn't happened yet.

"If green is just seen as a cost, forget it. It will never be truly implemented," said Eric Israel, a PricewaterhouseCoopers (PwC) managing director. "The supply-side footprint hasn't been at the forefront of corporate thinking. But companies have to understand that this is a fundamental shift. Sustainability makes complete business sense, because there are big risks in supply chain disruptions today." Israel cites water scarcity as one such risk, offering a compelling reason for companies to manage that resource properly.

Companies can and do make money from greening their operations. According to NRDC's Allen Hershkowitz, "Companies don't begin with initiatives that slow their growth or reduce their

profits — quite the opposite. Most of the greening focuses on squeezing out more efficiency, more revenue. Sports teams, for instance, use investment in environmental initiatives to attract a broader array of sponsors and investors."

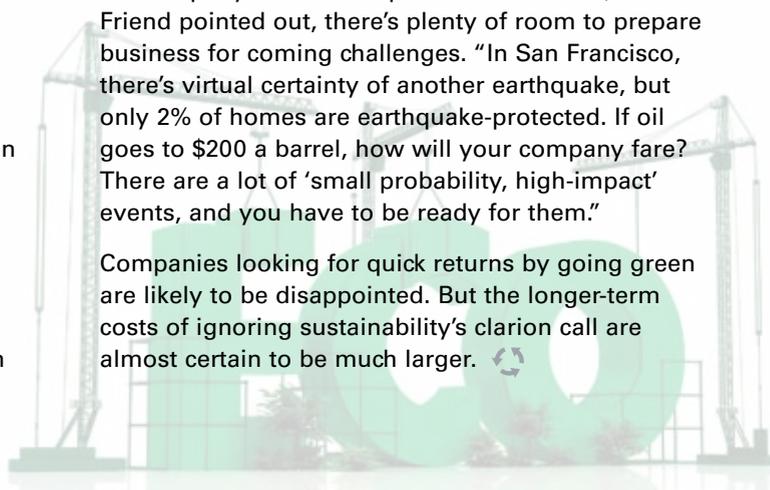
General Electric's (GE) Rajat Kapur said the key to understanding its corporate strategy "is to realize that environment versus economics is a false choice, and innovation is what unlocks the opportunity. If you look at 140 products through our internal metrics, you find \$150 million plus in savings to the bottom line — from reduced energy use and other factors."

GE's savings were made against plentiful headwinds. Today, Kapur said, supply chain lifecycle analysis is built into new product development at GE. But an assessment of thousands of company suppliers in developing countries found 16,000 potential issues, many of them in China. "It is a complex landscape, because requesting large amounts of data can cripple a small provider," Kapur said. "You have to focus your efforts where they will have the greatest impact. We found that only 10% of our suppliers in developing countries even knew how much energy they used. That led to our sharing best practices and offering sessions on expectations."

Increasingly, the resources are available. Software leader SAP builds tools that jump-start companies' efforts to track waste in their supply chains. According to SAP's Robert LoBue, "Our product is based on tracking hazardous materials, electricity and water use, waste produced, and much more. There are thousands of items in the catalog. We integrate that with supply chain systems and track all the different variables. It is a continuing revelation to us how much waste is generated in the supply chain."

No company can "future proof" its business, but as Friend pointed out, there's plenty of room to prepare business for coming challenges. "In San Francisco, there's virtual certainty of another earthquake, but only 2% of homes are earthquake-protected. If oil goes to \$200 a barrel, how will your company fare? There are a lot of 'small probability, high-impact' events, and you have to be ready for them."

Companies looking for quick returns by going green are likely to be disappointed. But the longer-term costs of ignoring sustainability's clarion call are almost certain to be much larger. 





The Greening of Supply Chain Information Systems

While robust software has helped revolutionize the management of today's global supply chains, the far more powerful software needed to green those supply chains is still evolving. The challenge is daunting: Not only must new systems collect, store, analyze and report on huge amounts of environmental data that no one has ever paid much attention to before, but they also have to weave all this new data into the complex web of supply chain records already in use. These were some of the key themes to emerge from a recent conference organized by the Initiative for Global Environmental Leadership at Penn/Wharton (IGEL) entitled, "Greening the Supply Chain: Best Business Practices and Future Trends."

Merging sustainability and financial data in the same system gives people in an organization the ability "to understand the impact of sustainability concerns on their business much better."

—Alan McGill, partner, PwC

This last step is crucial if companies want to use the output of these systems to actively manage their supply chains and not just report on them, says Adam Savitz, sustainability and climate change consultant at PricewaterhouseCoopers (PwC). To be truly sustainable, environmentally and economically, environmental factors must be fully

integrated into information systems, along with the existing financial data. Only then can managers weigh all the relevant information when making long-term decisions.

According to Alan McGill, a partner in PwC U.K.'s sustainability and climate change practice, merging sustainability and financial data in the same system gives people in an organization the ability "to understand the impact of sustainability concerns on their business much better." He adds: "The organization will be better positioned to know where the risks and opportunities for innovation are, and where they should focus their scarce resources, and avoid potential disruptions to business."

Critically important, as well, is the ability to make this fused environmental/financial information transparent both internally, so managers throughout the company can use it to make decisions, and externally, to allow for independent verification, information sharing throughout the supply chain and timely communication with various stakeholders. This kind of transparency has proven difficult to realize because corporations often consider the information confidential and resist any steps that might make it available to competitors.

To give clients a sense of what such transparency might look like, and to showcase what Bob Lobue, vice president of services partner operations at SAP North America, describes as the company's "very broad portfolio of sustainability solutions," SAP publishes its own sustainability report online. Following the reporting guidelines specified by the Global Reporting Initiative (GRI), SAP's report incorporates environmental, social and economic metrics. It also uses detailed graphics and interactive dashboards that allow anyone to review, for

example, the company's greenhouse gas footprint, in absolute terms from 2000 to 2011, both in total and by segment (everything from business flights to data centers). It also gives users the option of drilling down to get more detail – for instance, one can examine the same data by employee, by region.

But the SAP report also shows the difficulty of merging environmental and economic information. The fact is, that while some financial information is integrated with the environmental data in the SAP report, there are two separate reports online, Economic and Environmental. There is no “triple bottom line.”

‘Spreadsheet Mayhem’

Given all these challenges – collecting the right data, merging it with existing information, especially financial information, and enabling companies to share the potentially confidential results with others – it is hardly surprising that, as Gil Friend, CEO of Natural Logic, said at the IGEL conference, “the systems we have today are wholly inadequate to the task.” (Natural Logic is a strategic advisor to businesses on sustainability issues.)

What is surprising is that so many businesses are still only at the starting line when it comes to analyzing environmental metrics. Friend told conference participants that many of the world's best and largest corporations are using Excel to compile the data they need. “If you think about a global enterprise, with perhaps hundreds or thousands of locations, with spreadsheets at every location being sent into corporate where someone is collating those spreadsheets manually to produce a report, the economic cost of that is huge, but the opportunity cost is even bigger,” Friend explained. “We know one company where it's a senior vice president doing the collating.”

And it takes months, if not a year or more, to compile all this data and turn it into actionable information, which means that by the time the information is available to use, it is already out of date. “Spreadsheet mayhem,” he calls it.

Even so, there are advantages to be gained by such cumbersome, manual systems. Alex Markevich, senior principal at SAP, points out that companies can gain a new perspective by tracking and analyzing environmental data, even at the most basic level. “Sustainability is a lot about attention,” he says. Once people start focusing on sustainability, they begin to notice things they never

paid attention to before. “That's why that first step is so powerful. Even a bunch of people running around with Excel spread sheets are going to see some obvious, glaring things right away.”

Markevich adds an important caveat. SAP advises companies just starting out to take the time to map out the sustainability path they hope to travel with their suppliers in the future. Otherwise, with a short-term focus and limited budgets, suppliers may start down one path, only to find that they have to stop what they are doing and start the process all over again, ultimately wasting time and resources.

Time spent standardizing definitions early on is also time well spent. Setting standards and sharing sustainability information is useless without one centralized source of “truth” all along the supply chain, says Markevich. Such standardization is essential to good communications within and among companies, and it is a great enabler of both collaboration and creativity.

Single-minded Solutions

Companies just starting to build a greener supply chain tend to focus first on compliance, whether with government regulations or retailer demands. When Walmart announced its intention to become more sustainable several years ago, “that one statement got more attention in more boardrooms in the United States than anything that came out of the EPA (Environmental Protection Agency),” said Friend.

Even this first step, compliance with a clearly articulated set of pre-established rules, is not simple. Europe's REACH program (Registration, Evaluation, Authorization and Restriction of Chemicals) involves 100 pages of regulations and thousands of pages of guidance on how to comply with those regulations, points out Stephen Bogart, a partner at CSC Consulting. And REACH regulations are focused not on individual products, but on companies, says Markevich, “so it's important to know how much of a given toxic substance is in each and every product individual companies are shipping into Europe.”

With so many companies forced to comply with REACH, and with clear, even if voluminous, specifications about what compliance is required, it did not take the IT market long to respond. Several companies developed and now offer compliance software packages that address REACH, as well as other major regulatory programs. SAP's package, for example, automates and documents data collection,

coordinates all players and company stakeholders, and updates for the latest requirements.

Enterprise Solutions

Over time, companies that begin with compliance start to move along what PwC describes as “a maturity path, on a continuum that spans compliance, obligation, efficiency and leadership.” As they proceed on this journey, a company’s sustainability effort evolves from a compliance issue into an enterprise-wide operations issue. And that ultimately means that sustainability needs to be fully incorporated into the company’s Enterprise Resource Planning (ERP) system. As Bogart told the IGEL conference, “It cannot be done manually. It cannot be done on spreadsheets. It requires full integration with ERP.” And that, he said, “does require a huge investment in technology. Most large companies,” he added, “will spend upwards of \$200 million to try to get this right.”

Mixing sustainability data into ERP systems is worth this level of investment because ERP systems can enable companies to look at their businesses holistically and make decisions using information integrated company-wide: accounting, manufacturing, sales, marketing, distribution and customer relations.

While SAP and other companies structure environmental modules so that the components tie into existing ERP systems, this is still a long way from full integration of all relevant environmental data into ERP systems. According to SAP’s Markevich, companies cannot tell how much energy, carbon or water is embedded in individual products, for instance. Consider something as basic as electricity. ERP systems track how much a company pays the utility each month for electricity, but not how many kilowatt hours it used or what the source and carbon footprint of the power is. “The data set has to be expanded,” says Markevich. Every record has to have new fields added for all that information, “and people aren’t there yet. The answers to most environmental questions, as soon as they deviate from finance, are, ‘We don’t know.’”

As Peter Graf, the chief sustainability officer and executive vice president of sustainability solutions at SAP, puts it, SAP “has always tracked financial resources, human resources and capacities, but the company has never tracked energy, water, wood or any other type of natural resource. We never tracked these, as there was no perceived need, because

it was considered infinitely available. Now we are starting to manage these areas as a scarce resource, which is why applying enterprise resource planning and management is essential.”

Says Graf: “We used to live in a world where energy was cheap and information was expensive. Now, information is a resource that is becoming limitless, and energy and other environmental resources are becoming constrained. The sustainability journey is about using information to become better at managing the constrained resources.”

All of which explains why a December 2010 study of middle-market to large manufacturers, conducted by IFS North America and Affinity Research Solutions, found very few companies that gave high ratings to their ERP systems’ ability to handle environmental data. According to the study, “Manufacturing professionals were asked how helpful their enterprise software solution is in terms of its ability to help manage green supply chain initiatives. Slightly over half rated their current enterprise solutions unfavorably in its ability to assist with their green supply chain requirements. Only 5% rated their enterprise software as excellent in this area.”

But ERP providers are not sitting still. Markevich notes that environmental modules are “being integrated deeper and deeper into the core ERP offering.” It might take three to five years (“road maps haven’t even been defined yet,” he says), “but at some point, the environmental add-ons will move so deeply into the core ERP that it won’t be a separate thing.” When that happens, say the authors of the *PwC Technology Forecast* article, titled “Closing the Loop on Sustainability Information,” ERP will become ESP, or Enterprise Sustainability Planning.

The LCA Approach

For companies not ready or able to invest in such state-of-the-art ESP systems, Life Cycle Analysis (LCA) software has become an increasingly popular option. Noting the ability of LCA systems to collect, store, audit, report and analyze the environmental data related to a product’s complete life cycle, a 2011 study by Verdantix, “Smart Innovators Product LCA Software,” describes how companies can use LCA solutions to “address sustainable supply chain challenges.”

“New product LCA software suppliers,” says the Verdantix report, “have entered a market that

was previously dominated by complex solutions.” Among the benefits these suppliers offer are third-party databases, such as econinvent, the European Reference Life Cycle Database, and AMEE, which provide environmental data that might otherwise be hard to come by, especially for global companies. These databases track everything from resource extraction to waste management services, and they are most helpful when they are tailored to specific industries and regions. Other LCA benefits include the ability to define the scope of an analysis and to tailor the methods used and the outputs generated to suit user’s needs.

For all of these benefits, LCA studies can still be expensive and time consuming, which is why buyers started expressing interest in simplified LCA solutions two years ago. The market responded and new suppliers, says Verdantix “are bringing solutions to mainstream business concerns,” including simplified versions of programs that are less demanding and more user-friendly to non-technical staff. These new programs also offer a range of new LCA functions, including the ability to tailor interfaces to specific industries, automate legislative updates, access proprietary databases and run multiple scenarios that can help product designers make decisions about materials early in the design stage.

The Verdantix report recommends 18 “smart innovators,” based on what a company wants to use its LCA software to accomplish: environmental product compliance, supply chain optimization, sustainable product design or sustainable product communications. While a few of the 18 suppliers are best suited to one or another of these objectives, many can be useful for a variety of purposes, according to the report.

A New Approach to Data

As Friend, said at the IGEL conference, “life cycle assessment is a well-developed discipline that unfortunately is founded on really inadequate data.”

In fact, the same fundamental data problem underlies all of the IT solutions involved in greening the supply chain. Actually, there are two different problems. First is the issue of business confidentiality. “Customers want to know everything,” said Friend, “companies are reluctant to disclose everything. In some cases it’s competitive issues; in some cases there are concerns about re-engineering or about customers end-running a

supply chain, going to less expensive competitors.” Whatever the concern, the problem is that companies want and need to see each other’s data, but are unwilling to share their data.

The second issue is that the data everyone needs is distributed among countless suppliers in all corners of the globe, and each of these suppliers is collecting the data it believes is essential in the format that it finds most useful. The problem, of course, is that none of these data sets match up. “So how do you get comparability?” asked Friend. “How do you get computability? How do you reconcile all this information in a way that is actually functional? That’s the problem.”

Databases like those cited above have been developed, and Walmart is working with other major companies to try to develop a common framework for the methodology of life cycle assessment. But Friend’s new venture is taking a radically different approach to solving the data problem. Open Data Registry’s goal is to give “every product, every component, every batch that’s being moved through the system, its own URL.” The beauty of this patented approach is that, if it can be shown to work — and Open Data Registry is working on a pilot project now with a major international brand — it solves both parts of the data problem:

Confidentiality: According to Friend, the URL or internet product code, “is a long bar code like string of data that codes the critical information, carries the computable data — what materials are in here and in what quantities — but masks them to inappropriate access.” As a URL, the product code is “an addressable information fragment on the web that can be found from anywhere, addressed from anywhere, and have its confidentiality masked. So the data becomes accessible without disclosing where it is coming from.”

Distributed data: Friend believes it is unrealistic to think that all the disparate suppliers worldwide will ever agree on which information to collect or be able to standardize whatever data they do collect. “But what’s possible now,” he says, “through tools like Semantic Web is to build data dictionaries and manage distributed data systems so that we can find the right things and know where they fit without them having to be called the same thing or managed in the same way.”

Finally, rather than trying to anticipate everyone’s needs, Open Data Registry is planning to use

an open platform, in the same way Apple uses an open platform for the iPhone, so that each company can design its own app, whether an LCA tool or something else. That way, concluded Friend, “companies can themselves easily build

the analytics that answer their questions, using common reference data, the same data that everybody else is using, and we can accelerate this process of greening the supply chain.” 





Greening the Supply Chain: Driving Transportation Reform

Although Whole Foods is a major national chain, it prides itself in “buying local.” Shoppers who stroll its aisles are met with black-and-white photographs of the men and women who bake its bread or catch its shrimp. Reducing food transportation miles is an issue that resonates with environmentally conscious consumers, and it’s an important piece of the supply chain puzzle when it comes to reducing companies’ carbon footprint.

As the recent Initiative for Global Environmental Leadership at Penn/Wharton (IGEL) conference, entitled “Greening the Supply Chain: Best Business Practices and Future Trends,” made clear, however, there are opportunities and limits when it comes to reducing miles traveled.

Tracking Food Miles

“It can be better to buy strawberries that are imported from Chile than to grow them in a hothouse in Rotterdam,” said Dan Guide, professor of operations and supply chain management at Penn State. “Transportation is only 4% of the global supply chain, and it can be a bit of a red herring issue. There isn’t that much to save there.”

Gil Friend, the CEO of Natural Logic, a strategic advisor to business on sustainability strategies, looked at those same much-traveled strawberries and said that the advantages of growing them in Chile or Holland “depend on what kind of agriculture is practiced in each place. These issues aren’t as easy as you think.” Guide agreed. Among the factors that could tip the scale either way, he noted, are the heat source for that Rotterdam greenhouse, plus the energy and materials used to build it. On the Chilean side, it matters whether the strawberries were grown under natural conditions

(outdoors) and whether they were shipped as part of a regularly scheduled flight, not a special trip for strawberries alone.

“Transportation is only 4% of the global supply chain, and it can be a bit of a red herring issue. There isn’t that much to save there.”

—Dan Guide, professor of operations and supply chain management, Penn State

Jim Mason, co-author with Peter Singer of *The Ethics of What We Eat*, points out:

- Delivering small quantities of local products to many different markets may use more fuel than trucking a full load to a distant supermarket.
- Consumers who drive to outlying local farms or markets instead of doing one-stop shopping at a large grocery store may use as much fuel as would have gone into delivering distantly grown food to centralized supermarkets.
- Food production in another country may be less energy intensive than domestic production and the difference may be greater than the energy used in shipping the food thousands of miles. Mason says, “If you’re a Californian, imported rice produced by family farmers in Bangladesh is better energy- and ethics-wise than rice from energy- and chemically-dependent local agribusiness rice. In general, ‘buy local’ is best but sometimes there are stronger ethical reasons for buying imported food.”

Food is a world traveler, and 817 million tons of it is shipped around the world annually, reports the World Watch Institute. In the U.S., the Leopold Center for Sustainable Agriculture at Iowa State University says that food travels an average of 1,500 miles before it reaches the plate. But even so, Britain's Carbon Trust tracked a bag of potato chips and found that only 10% of its lifecycle greenhouse emissions were due to transportation and distribution; 36% came from farming and producing the raw ingredients.

Transportation is often mixed in with other issues, and agriculture makes that point clear.

Robert Giegengack, a professor emeritus at the University of Pennsylvania's department of earth and environmental science, pointed out that 80% of the winter fruits and vegetables grown in California's richly productive Imperial Valley use water pumped from long distances, a big energy drain that contributes to its carbon footprint. "The energy cost of transporting that water exceeds the transportation cost of moving it to market," he said. "Energy use is a fundamental issue. It takes 10 calories of fossil fuel for one calorie of food delivered to your home."

A 2010 Department of Agriculture study entitled, "Energy Use in the U.S. Food System," notes that half of that energy goes to moving highly processed snack foods — only a sixth is used to transport such essentials as grains, fruits and vegetables.

Rooting Out Transportation Waste

This isn't to suggest that transportation-related carbon doesn't matter, because often it's low-hanging fruit that can be easily picked with a satisfying return to the corporate bottom line. Edwin Keh, former COO and senior vice president of Walmart global procurement, and now a lecturer at Wharton, said that when the company began its deep dive into sustainability goals in 2006, it discovered that 90% of its carbon footprint was "outside the building," and transportation was a big part of that, often in unexpected ways.

For instance, Keh said, "When a consumer returns a defective product, it's a terrible waste of energy, with nobody profiting from it." The transportation cost includes returning the product to the distribution center, as well as the consumer's time and energy in making a round trip to bring it back, and more resources consumed in disposal. Walmart's new focus on product quality from its myriad suppliers

brought returns down dramatically. At the same time, the company took 700 trucks off the road by pressing suppliers to downsize packaging so that shipments take up less space.

Walmart challenged its manufacturers, within three years, to manage with 20% less energy use. "The first big chunk came from energy that was being wasted," Keh said. "We helped them locate some of that waste, such as machines that were running without doing anything because people didn't bother to turn them off at appropriate times. We put in meters that could measure consumption, and it resulted in behavior change: People started turning off lights, motors, water supplies." Also high on the list were idling diesel engines and unnecessary transportation trips.

In 2008, Walmart brought its Chinese suppliers together and told them that a central company goal, by 2012, was zero defective merchandise returns, which would obviously lead to a huge reduction in unnecessary transportation costs.

Policing Supplier Fleets

Ensuring that supplier-based trucking fleets run smoothly is also a challenge. Jeff Langenfeld, Walmart's vice president of international logistics, said that one of the company's biggest challenges is ensuring reliable truck transportation from its suppliers. "We have no expectation that every supply chain has to be world class," he said. "Most of the time, our suppliers over-promise. But our goal is to be first among our competitors. We work with their supply chains to add efficiency to the last 50 miles before products reach our store shelves."

Tom Carpenter, director of logistics for International Paper in North America, said the company sees a distinct advantage in shipping by rail, which is 3.5 times more efficient than moving the same goods by truck. "Trains don't go everywhere," he said, "so not everything can go by rail. But becoming an intermodal shipper means a 50% reduction in fuel consumption."

The company also aims to reduce the number of shipments, and thus carbon impact, by running larger loads. Carpenter said that if it could increase each truck's load by 1.5%, some 5,000 trucks could be taken out of the company's network. International Paper has taken aim at freight regulations that restrict truckloads to 80,000 pounds on federal highways. "That means a 10-foot void in every truck," Carpenter said. "We're recommending

passage of H.R. 763, which calls for a federal weight limit of 97,000 pounds, and a sixth axle on trucks to redistribute the weight and avoid increasing damage to the roads." Some truck safety groups oppose the bill.

The Dow Chemical Company doesn't own its trucking fleet, preferring to focus on its core competencies. It moves 85% of its product shipments globally by truck, compared to just 77% in North America. Rail is 5% of shipments (but 20% of volume) globally, but 10% of shipments (and 35% of volume) in North America. Henry Ward, global supply chain director at Dow, attributes the numbers to inadequate or missing freight networks in many parts of the world. "Clearly, we would like to see rail infrastructure grow in other world regions in order to provide more sustainable transportation options," Ward said.

According to Ward, since 2007 Dow has "focused heavily on the energy and greenhouse gas emissions involved in transporting our chemicals. We're looking not at where our footprint is today, but where it will be in 2015. Our goal is to set a cap at 2008 emission levels and reduce below that." Since 1998, Dow has reduced its energy intensity 40%, saving \$24 billion and 5,200 trillion BTUs of energy — the equivalent of the annual consumption of 20 million homes. The same reduction avoided more than 270 million tons of greenhouse gas emissions.

Achieving those goals has meant, among other things, more fuel-efficient vehicles and hybrids, adoption of no-idle policies, and improving truck aerodynamics and driving practices (which alone reduced fuel consumption by 7%). The company is also working with the U.S. Environmental Protection Agency (EPA) Smartways program to choose the most efficient trucking options. Some 70% of its volume by weight, and 80% of its ton miles, are moved by Smartways carriers.

And, like International Paper, Dow is working to combine shipments. It uses GPS technology to track the movement of its goods around the world and to ensure they are transported as efficiently as possible. Ron Widdows, CEO of Rickmers Holdings in Germany and chair of the World Shipping Council, said that the International Transport Forum, "80% of shipping orders still arrive by fax... there is a huge opportunity to get more sophisticated." Walmart's Langenfeld adds, "The need for better and more detailed levels of information is absolutely critical if supply chains are going to become more dynamic. We need to speed up information flow."

Bottom Line Benefits

Adding efficiency to any part of the supply chain produces better returns. "The good thing is that much of what we do to improve fuel economy translates to the bottom line as improved profitability," Ward said. "Every bit of energy you save is money in your pocket." That's important for Dow, a winner of five American Chemistry Council "responsible care" awards for energy efficiency, because like many other companies it has concluded that the reforms it makes in the value chain must enable profitable growth. Every change has to be cost-competitive.

Fuel costs are a huge driver for supply chains, particularly in the current market, and that's why fuel-efficiency gains matter so much. According to Widdows, large container ships can burn through \$50,000 a day in bunker fuel, so a 10% to 20% efficiency improvement on the most modern designs is highly significant.

The engines on trucks and container ships often burn fuel around the clock, so delays at border crossings can be hugely costly. Standardization is key. Catharina Elmsäter-Svard, the Swedish minister for infrastructure, points out, "It's hard to have seamless shipping corridors when trains cross a border and encounter many differences in how rail lines operate."

Walmart also saved on transportation carbon by switching fuels — four out of 10 of its trucks now run on biodiesel. Other companies have made similar commitments to alternative fuels, and Frito-Lay (a division of PepsiCo) made headlines by announcing in 2012 that it plans to switch its entire tractor-trailer fleet to natural gas. Because of the low-cost of natural gas — with a savings over diesel equivalent to \$2.50 a gallon — the company expects to payback the extra cost of the trucks in as little as a year and a half.

Regulation is also a major factor. According to Eric Israel, a managing director of PricewaterhouseCoopers (PwC), companies like FedEx and UPS are deeply committed to tracking their carbon emissions, for a variety of reasons. "The price of oil and fuel volatility is definitely a driver, but not as much as the push to reduce carbon emissions," he said. "Trucking firms, the maritime industries and aviation globally, they're all responding to tightening regulations governing emissions. We're going to see major shifts to improve their overall efficiency."

Frito-Lay has also invested in battery power for its short-haul box trucks, as have Coca-Cola and Duane Reade pharmacies. But hybrid and electric trucks have longer return-on-investment times, and large fleet operators — including UPS and FedEx — have moved cautiously in adopting the technology, often making purchases only when federal subsidies can reduce the purchase price.

Subsidies and Fleet Fairness

A variety of federal and state programs help defray the cost of “greening” corporate fleets, including a \$7,500 federal tax credit for purchasers of electric or plug-in hybrid vehicles. But Ruben Lobel, a Wharton professor of operations and information management, asks why those subsidies have to be one-size-fits-all. It’s an important question if reducing fleet emissions is seen to have some urgency to it.

“Someone who buys photovoltaic solar panels in New York pays \$30,000 and gets \$20,000 back from the government,” Lobel said. “Where did that figure come from, and how many solar companies will go into business based on it? And if a consumer buys a Chevrolet Volt and gets back \$7,500, why isn’t it \$9,000? Why do cars all have the same rebate when they cost many different prices?”

Lobel points out that with a fixed subsidy, the \$109,000 Tesla Roadster gets much less subsidy relative to its cost than a \$40,000 Chevy Volt. “That could be perceived as unfair,” he said, “but a one-size-fits-all subsidy has the advantage of not favoring any particular company, and it adds a level of certainty to the market for manufacturers, retailers and consumers, as opposed to a more complex incentive system. One problem is that fairness is a poorly defined concept, and we understand economic efficiency much better than fairness.”

Subsidies are important, but used the wrong way they can kill a market, Lobel said. He cites the example of Spanish government incentives, launched in 1997, that were intended to not only jump-start the solar market, but establishing the country as a major player in it. “But in 2008 they cut back on the subsidies and the industry went down, with the bankruptcy of some companies,” Lobel said. “Such changes of policy can be devastating to industries.” Germany’s government has been a more reliable partner for solar start-ups.

Rethinking Corporate Fleets

Companies that buy transportation services, rather than own large fleets, have a range of options for reducing the impact of moving their goods. Nate Morris, co-founder and CEO of Rubicon Global, a new player in the waste and recycling industry, points out that waste haulers own both trucking fleets and landfills, giving them a vested interest in maximizing the use of both.

Rubicon Global, which is a “asset-light” company, does not own any trucks or landfills and is thus motivated to help clients avoid the costs involved in hauling waste to landfills. Rubicon Global was able to help a major grocery chain dramatically reduce transportation costs to and from the landfill by re-engineering their logistics to operate at peak efficiency. And in one case, Rubicon Global actually turned part of the waste stream into a revenue stream by selling thousands of worn-out uniforms slated for disposal to a company that shreds them for alternative sustainable uses, including animal bedding and furniture padding. Overall, Morris said, his company helped this customer increase revenue from recovered goods by 25% and reduce gas consumption related to waste by 40%.

A goal, says Andrew McKeon, founder and principal of the BusinessClimate consulting firm, is to see transportation as a service, and one not necessarily provided by an in-house fleet of vehicles. This is the business model Xerox uses when it leases and services its copiers, and that Electrolux uses when it leases washing machines in Sweden. And it is inherent in the car-sharing model pioneered by companies such as Philly Car Share (now owned by Enterprise) and Zipcar.

“If you want a convertible or a minivan, you can have access to one just when you actually need it,” McKeon said. “BMW could become a service company.” One advantage of automakers retaining ownership of their vehicles is it simplifies end-of-life options.

Car-sharing has proven a robust model internationally, and it has expanded into being a service provider for corporations. Sharing has also been taken up by mainstream car-rental agencies such as Hertz. The most recent twist is so-called personal car sharing, which allows individuals to in effect loan out their own cars. Legalizing that service requires state action and insurance guarantees.

The “last mile” of the transportation supply chain is increasingly important, and in Europe there’s renewed focus on making that last mile zero emission if possible. The European Cyclists’ Federation is getting serious consideration for its proposals to move as much as 25% of light goods on cycles (sometimes with electric assist). It’s already happening in France. La Petite Reine moves a million packages a year with a fleet of 60 cargo bikes, and has saved 203 tons of carbon

dioxide. Urban Cab, recently launched in Paris, and its 10 Cyclo-Cargo bikes have delivered more than 200,000 packages in France, covering 37,000 miles per year. The French railway, SNCF, has also invested heavily in cargo bike delivery.

The modern supply chain clearly faces many challenges. Reforming the transportation component is not the largest target, but it’s one of the ripest pieces of low-hanging fruit. 



Special Report

GREENING THE SUPPLY CHAIN: BEST PRACTICES AND FUTURE TRENDS



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