

booz&co.

How Big Is Your
Carbon Footprint?
*Before You Can Build
An Energy-Efficient
Supply Chain, You
Need to Understand
Your Company's
Carbon Emissions*



Booz & Company is a leading global management consulting firm, helping the world's top businesses, governments, and organizations.

Our founder, Edwin Booz, defined the profession when he established the first management consulting firm in 1914.

Today, with more than 3,300 people in 58 offices around the world, we bring foresight and knowledge, deep functional expertise, and a practical approach to building capabilities and delivering real impact. We work closely with our clients to create and deliver essential advantage.

For our management magazine *strategy+business*, visit www.strategy-business.com.

Visit www.booz.com to learn more about Booz & Company.

CONTACT INFORMATION

McLean

Joseph Martha

Partner

+1-703-902-4004

martha_joseph@bah.com

New York

Martha Turner

Principal

+1-212-551-6731

martha.turner@booz.com

Originally published as:

How Big Is Your Carbon Footprint? Before You Can Build an Energy-Efficient Supply Chain, You Need to Understand Your Company's Carbon Emissions,
by Georgina Grenon, Joseph Martha, and Martha Turner, Booz Allen Hamilton, 2008.

How Big Is Your Carbon Footprint?

Before You Can Build an Energy-Efficient Supply Chain,
You Need to Understand Your Company's Carbon Emissions

As concern mounts over rising fuel prices, the long-term availability of energy, and climate change, companies are turning their attention to one area where opportunities to conserve energy and reduce carbon emissions abound: the industrial supply chain.

Four factors are the main drivers of this new interest in a cleaner, more energy-efficient supply chain. First is the desire to cut energy costs. By rethinking the processes and sources of energy they use, companies can cut their supply chain expenses. Second is a concern about regulation. Using trading permits, mandated caps, and/or fines, governments are increasingly putting pressure on businesses to limit the amount of carbon they release. Third is competitiveness: the recognition that a growing segment of customers favors companies that credibly demonstrate a reduction in their carbon impact. And fourth is a desire to boost productivity, based on the knowledge that emissions-reduction programs can lower other costs and improve operations.

Unlike first-generation environmental initiatives, which often sounded good but weren't necessarily the best ways to reduce emissions, today's "green" policies are chosen by smart companies on the basis of a disciplined decision-making process that looks across the entire supply chain. Companies that have reached this level of maturity are not content to simply appear to "do the right thing." They are committed to researching and actually doing the most effective and beneficial thing—not just for the environment but also for themselves and for their customers.

Surprises in the Supply Chain

These smart companies have learned that the best way to start reducing their total carbon impact is to understand how much energy is used in each link of the supply chain. This analysis, often referred to as "measuring the carbon footprint," typically uncovers a surprising number of opportunities for smarter energy consumption—some of them quite counterintuitive (see "What is a Carbon Footprint?", page 2).

In 2006, the Carbon Trust, a United Kingdom-based research and advisory group, discovered a "perverse incentive" in the sourcing of raw potatoes for manufacturing snack foods in Europe. (An analysis of this case appeared in the report, "Carbon Footprints in the Supply Chain: The Next Step for Business."¹) Working with a major food manufacturer to study the carbon footprint of the potato chips it made, researchers found that because prices are set by weight, farmers were controlling humidification to produce moister, heavier potatoes. Even within the strict specifications for moisture content set by food manufacturers, these few grams of extra water were significant. Moreover, the extra cooking needed to burn off that water accounted for an unexpectedly high percentage of the chips' energy consumption.

An obvious solution, wrote the Carbon Trust in its report, would be to change the procurement contract in a way that would favor farmers who produced potatoes with less moisture. This simple change would reduce emissions from the potato-frying stage by 10 percent and slash carbon dioxide output by up to 9,200 metric tons each year.

¹ "Carbon Footprints in the Supply Chain: The Next Step for Business," Carbon Trust, www.carbontrust.co.uk/Publications

What Is a Carbon Footprint?

The term “carbon footprint” refers to the total amount of carbon dioxide (CO₂) and other greenhouse gases emitted over the entire lifecycle of a product or service. Typically expressed in tons or grams of CO₂, the carbon-footprint concept helps businesses and governments understand the relative amount of damage a particular product or service causes to the environment.

Methodologies for measuring carbon footprints are still being developed, in part because debate continues over how much responsibility a company bears for all of the carbon released by its value chain. From a supply chain perspective, however, carbon emissions are just another kind of waste, and eliminating waste from any link in the extended supply chain ultimately boosts the efficiency of the whole.

It would also be a win for shareholders, because that reduction in energy consumption would cut the company’s annual costs by 1.2 million British pounds. This reduction might also position the manufacturer to take advantage of carbon trading credits in the European Union (see “Cash for Trash,” page 5). Moreover, it would set a precedent for further collaboration between food manufacturers and their agricultural suppliers. Working together, growers and the manufacturers would reduce both their emissions and their operational costs with no need for additional investments—proof that being green can be good business.

We are convinced that there are many such surprises in every supply chain, just waiting for someone to uncover them by asking, “What are we doing that wastes energy and generates unnecessary emissions?”

Recycling: Just Part of the Picture

As the potato chip manufacturer discovered, a close analysis of the total amount of energy consumed and/or the carbon produced during the entire sourcing-to-delivery process can yield surprising results. After taking a look at where energy is actually used in the supply chain, manufacturers might find that many of the action items on their to-do lists—such as creating more concentrated products, sourcing from nearby farms, or using recycled materials—are in fact relatively ineffective ways to reduce emissions.

Consider the case of recycled paper versus virgin paper. Newspaper A is made from 50-percent recycled

pulp in Location A. Newspaper B is printed in Location B on 100-percent virgin paper. Which one is more environmentally friendly?

Almost everyone would answer “A.” But the answer is not so simple. It’s true that recycling paper does save on energy. In fact, 70 percent of the energy consumed in the process of turning trees into a newspaper occurs during the pulp and paper manufacturing stage. The less new pulp needed, the better for the environment.

But paper manufacturing is such an energy-intensive process that the paper plant’s energy source may have more impact on carbon emissions than does the share of recycled pulp used. Thus, if Newspaper B (made of 100-percent virgin paper) is produced using a renewable energy source such as hydroelectric power, the total carbon footprint will likely be much lower than that of Newspaper A (printed on 50-percent recycled paper) if all of the latter’s paper was produced with power from a carbon-fueled energy source.

This is not to say that recycling is overrated; it may well be an important part of a solution for reducing carbon emissions. The point here is not to assume that a popular measure such as recycling is the only way to reduce carbon emissions for every product. Because each product’s carbon footprint is unique, the solutions for shrinking that footprint will also be unique.

For some companies, the best approach to carbon reduction will be to work with suppliers to find alternative materials and production methods. Some may even need to find new suppliers. Other companies may

find that the best approach is to reduce and simplify packaging or switch to less carbon-intensive energy sources, such as renewable energy and more efficient lighting. Lastly, companies may find government-sponsored incentives to be valuable. Some business-to-business producers and service providers, including gasoline retailers and airlines, are using government-mandated pollution credits to offer services for customers who are concerned about climate change (“Buy our product and help offset your own greenhouse gas emissions”).

Three Steps to Carbon Reduction

Identifying the best opportunities for carbon reduction along a product’s supply chain is not easy, and managers may be intimidated by the complexity of that task. Fortunately, there is a straightforward, proven process that can help them grasp the extent of the carbon emitted by their supply chains. This process allows executives to begin framing the issue, identify some of the most significant opportunities, and gather the information needed to support decision-making. Although the group charged with undertaking this kind of analysis varies by corporate structure and industry—some handle it in-house through their supply chain organizations, while others look for an external team of experts to do the spadework—in every case the analysis requires taking the following three steps:

1. Understand the carbon footprint of each product or service. The first step toward making good decisions about carbon reduction is to understand the specific carbon footprint of the supply chain, product by product, in the context of the company’s overall strategy and operations. To do that, managers should start by drawing the same kind of process map that operations experts use to optimize supply chain efficiency. Instead of looking at the time or cost of each supply chain activity, however, the focus should be on where, how much, and which kind of energy is consumed by those activities. Each product-specific chart should include all of the steps involved in the product’s supply chain throughout its lifecycle, from raw-material production and distribution to manufacturing

(including disposal of manufacturing wastes), finished product distribution, sale and use, and disposal (including recycling). The chart should make careful note of where energy is used.

2. Separate necessary emissions from those that could be reduced or eliminated. After determining where energy is being used, companies should identify which segments of those energy expenditures are essential to the creation of a product or to the transformation of a raw material or work in progress. If something is not essential or it is being wasted—through the generation of more heat than is necessary to complete a task, for instance—then they should consider whether that element could be eliminated or reduced by changing the design of the product or the way the transformation is executed. Through this analysis, they can identify and assess the true drivers of carbon emissions and opportunities for reduction.

3. Zero in on measures that provide the greatest benefits for the cost involved. The final step is to weigh the alternatives in the context of different considerations, such as effective contribution to reducing the footprint, impact on financials, or ease of realization. Ultimately, the optimal carbon-savings initiative will involve a combination of measures. The first is demand reductions (which can be achieved by raising energy efficiency in design, construction, and operation). The second is replacement of conventional energy sources and materials with lower- or zero-carbon alternatives. There’s also a third option: an offset of unavoidable carbon emissions through some kind of credit-generation and trading program.

This analysis is actually much more straightforward than it sounds. Consider the example of a production process that requires boiling one metric ton of water. The company’s first step would be to determine what kind and how much energy is being used to boil the water. The next step is to find out whether the boiling stage constitutes an intrinsic part of the production process. If it is, then it’s a “product need,” as opposed to an element (such as packaging) that might be changed. Assuming that the step is essential,

the next question is whether there's a way to boil the water with fewer emissions. Perhaps the water could be preheated using heat generated by another activity in the plant, thus reducing the need for energy and with it, the product's carbon footprint. Other alternatives, such as using renewable energy to boil the water, might also be considered.

This type of analysis can actually simplify environmental decision-making. Knowing how much carbon is generated at every point in the supply chain lets executives see the most cost-effective places to take carbon emissions out of the system. It takes what may be an emotional or public relations-driven decision and turns it into a more pragmatic question of resource allocation.

Similar approaches have been used to study the carbon footprints of a wide range of products, from Unilever's Vaseline hand lotion to Kodak cameras. In Europe, more narrowly focused efforts have shown positive results. For instance, Europe's "Green Dot" labeling program has encouraged companies to look at ways to create simpler, more eco-friendly packaging. The Green Dot initiative, which in 15 years has grown to include more than 130,000 companies in 32 countries, has to date recycled more than 14.7 million tons of material.

Intuition Can Be Wrong

When a company measures its carbon footprint, the most surprising outcome would be to find no surprises. During that exercise, many companies have been surprised to learn how little they knew about their supply chains' carbon emissions. Typically, their ignorance stemmed from preconceptions that prevented them from recognizing some opportunities to reduce emissions. The potato chip manufacturer, for example, had assumed that the transportation of finished goods and raw materials was the greatest source of emissions, but in fact it was dwarfed by the amount of greenhouse gases generated by production.

In some cases, transportation and logistics may indeed prove to be a significant source of carbon emissions. A 1993 study of Landliebe Yogurt (a local brand

produced and sold in Stuttgart, Germany) revealed that the various ingredients and components of a single container—including milk, strawberries, wheat, cultures, glass for the jar, paper for the label, and aluminum for the lid—had traveled a total of more than 9,100 kilometers (about 5,600 miles) before reaching the consumer.

Solutions for reducing transportation-related emissions vary. Some initiatives will improve transportation efficiencies: A truck that once carried 150 items will be reconfigured to carry 300, or its motor will be re-engineered to carry the same volume of goods with less fuel. Others will turn to local sourcing. The U.K.'s Marks & Spencer department store, for example, is trying to reduce the number of "food miles" its products travel by sourcing its wares from nearby producers and working with local farmers to lengthen the growing season.

Sometimes local sourcing is not the most energy-efficient choice. For instance, a grocer in a cold climate who purchases tropical fruit from a local farmer could actually be increasing carbon emissions if heating the greenhouse where the produce is grown generates more pollution than importing the produce from a tropical country would. Thus, the intuitive answer may not always be the right one. As H.L. Mencken, the American cynic, once noted, "For every complex problem, there is an answer that is clear, simple—and wrong."

Green Is Gr\$\$\$n

At the smartest companies today, boosting energy efficiency is no longer an initiative motivated primarily by a sense of civic duty. Rather, companies are finding that there is a solid business case for building a more energy-efficient company.

Many business people, though, still need to overcome the old attitude that environmental initiatives are probably expensive and certainly unprofitable, almost a kind of pro bono activity that distracts them from their real work. Instead, they must begin to see such initiatives for what they are: opportunities to make their companies more profitable by reducing wasted resources—all while making a contribution to society.

Only by looking at environmental initiatives in that light will companies be able to evaluate the opportunities for savings in the same way they would make any other business decision, whether investing in a company or buying a piece of equipment. Since the most significant opportunities for saving energy may not be readily apparent, it's important to at least make a basic assessment of the supply chain's full carbon footprint before deciding where to assign resources.

Experience has proven that in some cases it is possible to reduce emissions and even to reduce operational costs with no additional investment. When the carbon footprint analysis is done right, solutions can often be quite simple—sometimes, as in the case of the potato chips, as easy as changing a clause in a contract to foster collaboration toward a mutually beneficial goal.

Cash for Trash

Carbon trading is not yet a widely familiar concept in the United States, but many European manufacturers have adapted to the system since it was put into effect in the European Union in January 2005.

The idea behind the EU's Emissions Trading Scheme (ETS) was ingenious: Instead of simply prodding and fining companies into compliance, the EU would give its biggest polluters financial incentives to reduce the amount of greenhouse gases emitted by their plants. The centerpiece of the plan was the creation of a market for carbon dioxide (CO₂). This system would provide market-based incentives for "good" (i.e., energy-efficient) behavior and penalties for "bad" behavior.

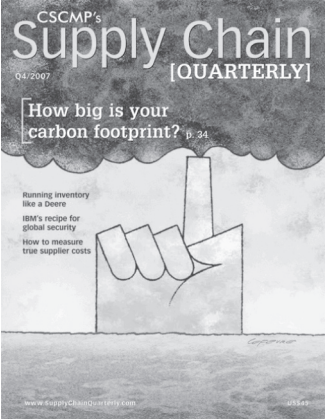
The EU set a cap on the total amount of CO₂ emissions for Europe's 12,000 most energy-intensive companies. These companies were given permits that allowed them to emit a certain amount of carbon. Those that used up their permits could buy more from energy-efficient companies that did not use all of their allotted emissions. Polluters that continued to emit carbon dioxide without buying more permits could be fined.

Most permits are traded through the all-electronic European Climate Exchange (ECX). Today, a brisk trade in futures and options on EU emissions permits are conducted over the exchange. According to ECX's data, open interest in emissions futures now stands at nearly 175,000 contracts, representing a total of 175 million tons of CO₂ emissions allowances.

The EU government planned to gradually ratchet down overall carbon levels by limiting the number of permits. The idea was that by 2012, the trading system would reduce emissions to a level 8 percent below 1990's emissions. So far the major economies, such as France, the United Kingdom, and Germany, are on track to meet their targets but most other countries are not. Operational problems have marred the success of the emissions trading scheme. In the initial three year test phase, the price of an allowance climbed, just as economists had forecast. By the spring of 2006, the market value of the allowances reached a total of US \$24.3 billion, and in May of that year prices had risen to more than 30 euros per ton. At that point, however, several countries announced that their industries had been allocated more permits than they could use. The price crashed as a result, from 30 euros per ton to 10 euro cents in September 2007. In response, the EU has cut back on the number of permits issued for 2008, and those prices are expected to be more stable.

The European Commission is now looking for ways to improve the program. Plans call for extending emissions trading to the aviation and shipping industries as well. The inclusion of shipping in carbon trading could have an enormous impact as EU member states own more than 40 percent of the world's shipping fleet.

This article originally appeared in the Fourth Quarter 2007 issue of *Supply Chain Quarterly*, which is published by the Council of Supply Chain Management Professionals.



BOOZ & COMPANY WORLDWIDE OFFICES

Asia

Beijing
Hong Kong
Mumbai
Seoul
Shanghai
Taipei
Tokyo

Australia, New Zealand, and Southeast Asia

Adelaide
Auckland
Bangkok
Brisbane
Canberra
Jakarta
Kuala Lumpur
Melbourne
Sydney

Europe

Amsterdam
Berlin
Copenhagen
Dublin
Düsseldorf
Frankfurt
Helsinki
London
Madrid
Milan
Moscow
Munich
Oslo
Paris
Rome
Stockholm
Stuttgart
Vienna
Warsaw
Zurich

Middle East

Abu Dhabi
Beirut
Cairo
Dubai
Riyadh

North America

Atlanta
Chicago
Cleveland
Dallas
Detroit
Florham Park
Houston
Los Angeles
McLean
Mexico City
New York City
Parsippany
San Francisco

South America

Buenos Aires
Rio de Janeiro
Santiago
São Paulo