

Sustainability Watch



Green Shipping

Updated
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Environmental Concerns & Potential Cost Savings Ring in Era of Green Shipping

Watch List

- SmartWay Program, the Environmental Protection Agency's (EPA) partnership with the freight industry to reduce greenhouse gas emissions and increase fuel efficiency, is undergoing a transition, and SmartWay 2.0 will be implemented in 2010.
- Two climate change bills, the American Clean Energy and Security Act (ACES, or the Waxman-Markey Bill), and the Clean Energy Jobs and American Power Act (Kerry-Boxer Bill), are making their way through Congress, and would impact regulations on carbon emissions.
- The international community will meet in December 2009 to decide on the successor to the Kyoto Protocol. The US is expected to participate more fully in this plan.

Key Takeaways

- All shipping and transport activities are carbon based and create greenhouse gases that impact the environment. While fuel standards and some emissions have been regulated by the EPA, greenhouse gases have not.
- Because fuel efficiency saves money and reduces emissions, companies often start greening their transportation by reducing fuel use.
- Managing the environmental impact of shipping goes beyond fuel efficiency and can be complex and costly. The first step in environmental management lies in garnering a clear understanding of a company's carbon footprint.
- Regulation is expected to increase on the local, regional, federal and international scale.

Related Sustainability Watch Reports

- Alternative Fuels
- Biofuels
- Compressed Natural Gas Fleets
- Lean Manufacturing





Executive Summary

Shipping and transportation make up a large and complex part of most supply chains, and as issues of global climate change become ever more prevalent, transportation holds the dubious honor of being the fastest-growing source of US GHG emissions. Carbon dioxide (CO₂) and other greenhouse gases (GHGs) are emitted through the burning of fossil fuels and are responsible for a host of global environmental concerns. Since the issue of climate change became prominent in the 1990s, international governments and nonprofit organizations have been working to address the impact of human activity on climate. It is expected that regulation will increase in an effort to reduce the amount of greenhouse gas emissions put into the air.

Up to 75% of a company's carbon footprint can come from transport and logistics activity. The bulk of US transport moves by truck, and, by extension, by diesel fuel. International marine vessels, while far more efficient at moving goods than trucks, also run on diesel fuel and have annual GHG emissions on par with those of the country of Germany. While diesel fuel has historically been regulated by the EPA, these regulations have referred only to fine particulate matter and other pollutants that impact human health and add to smog and acid rain. There has not, to date, been regulation on GHG emissions.

Luckily, in transportation, lean and green can go together, as was seen when oil topped record-breaking prices in 2008. Even without the onus of reducing their emissions, businesses have spent time working on reducing fuel consumption through more efficient routing, better placement of distribution centers, and new technologies that help trucks run more aerodynamically. All of these solutions reduce costs while also reducing carbon emissions. But sustainable,

green shipping (transportation and logistics activities that strive to limit GHGs), must go beyond the low-hanging fruit of fuel efficiency. While a majority of logistics managers state that environmental concerns are important to them, a significantly smaller number said they would be willing to pay more for such innovations.

Going forward, however, it is likely that businesses will not have the luxury of choosing whether or not to manage the environmental implications of their supply chain and shipping. Carbon output regulation is currently pending on the local, regional, federal, and international levels. Most regulation will be in the form of a cap-and-trade policy, wherein different industries would be given a certain cap on allowable emissions and would need to purchase additional allowances as needed. Given the likelihood of regulation, proactive businesses will want to be ready. Businesses should take the initial step of understanding their greenhouse gas emissions, and, once they have measured this amount (referred to as a carbon footprint), they will be better prepared to reduce it.



Train Passes by Container Ship
Canadian Press 2002



Business Options

Over the past several decades, the idea of environmental sustainability has gained traction, and many businesses have made strides in increasing recycled-content materials, recycling and reducing energy, and implementing other onsite environmental initiatives. But it is only more recently that the zeal for green moved offsite – and onto the road. Green transportation and shipping is a growing area of focus, particularly when companies realize that their carbon footprint and transportation costs are inextricably linked. According to the EPA, in 2006 trucking made up 5.6% of the whopping 7,075 teragrams (trillion grams) of CO₂ emitted. Since 1990, overall transportation (which includes passenger cars and light trucks as well as freight) has been one of the fastest-growing causes of GHGs, and this increase represents 48% of the total increase in GHGs since 1990. In addition to the road, international shipping makes transportation's footprint even larger, with 2007 GHG emissions roughly the same as the entire country of Germany and an expectation that the number could quadruple by 2050. For companies, these polluting emissions come at a steep price. In 2008, when oil prices went up to record-breaking highs of over \$145 per barrel, companies and consumers felt the increase on the bottom line. As of August 2009, prices had fallen back to \$70/barrel, but the volatility of the oil market remains a key issue in transportation.

What is sustainable shipping?

Sustainable, or green, shipping is generally defined as logistics and transport operations that strive to limit the company's GHG emissions. A company's GHG output is often referred to as its carbon footprint, meaning the amount of carbon dioxide and other greenhouse gases it uses. CO₂ is the most common greenhouse gas. All modes of transport, be they truck, ship, rail, or airplane, are in some way carbon-based, and they all add to an organization's

carbon footprint. Freight-heavy organizations have long looked to reduce fuel consumption as part of their profitability model, with companies like United Parcel Service (UPS) using alternative fuel vehicles as early as 1995. However, it was not until oil prices skyrocketed and environmental concerns grew dire that the issue jumped to the forefront. In a survey of companies that award logistics contracts, 75% of them include sections on environmental compliance in their search, and 70% of companies stated that environmental compliance was "very important" or "reasonably important" to them.

In 2008, the EPA held the first SmartWay Transport Partnership International Summit. Launched by the EPA in 2004, SmartWay is a government-business-consumer partnership formed to identify products and services that reduce transportation-related pollution. Retailers and carriers from 12 countries came to the event, and it drew tremendous interest from businesses that wanted to reduce both fuel consumption and their GHG output. However, while SmartWay is still a robust program, the economic slowdown and lower oil prices have meant that there is not the same level of commitment to greening transportation. While companies assess and reduce their carbon footprint for many reasons, studies show that fuel prices are the largest driver of interest in sustainability initiatives. Still, there are more ways to address green transportation than just cutting fuel costs, and there are more reasons to do so as well.

Benefits of Green Shipping

Much of the early work in reducing fuel consumption has been done for years under the guise of profitability and cost cutting. In its simplest form, cutting fuel costs also cuts emissions, helping the environment and the bottom line. An efficient transportation system is one that inherently limits waste and promotes efficiency, which should help it be green. Indeed, for companies just beginning to address the carbon footprint left by



their transportation operations, simple changes may reap big benefits. Issues such as rerouting to less congested routes, limiting the number of half-full trucks, and reducing idling times are all relatively straightforward ways to both improve cost efficiency and reduce GHGs.

In addition to the cost savings, there are other reasons companies pursue these initiatives. Often, it is because the customer demands it. As the dire state of the environment gains more attention, consumers are demanding green services from their businesses, and consequently businesses are demanding green solutions from their logistics partners. In a survey of logistics companies, the number one reason companies gave for greening their transport was customer relations, and the number two reason was public relations. GHG emissions can be measured, reduced, and publicized; it makes a good story to be able to share these successes.

One popular method to deal with emissions is to purchase carbon offsets. This is a process in which companies purchase carbon “credits” that invest in projects to reduce carbon, like wind farms or reforestation. This is a common method in green shipping, but is controversial, as many environmentalists consider this a way to buy the right to conduct business as usual. Still, the purchase of carbon credits remains a popular choice, and companies use it to stand out and gain a competitive advantage. For example, freight company EA Logistics launched its “Delivered GrEAn” program. EA will measure the carbon footprint of each delivery and purchase carbon credits to offset or neutralize that delivery. The company also uses biodiesel and works with companies to save money by finding the most fuel-efficient route. This focus on green won EA the opportunity to be the shipper of choice for the Wal-Mart/Quest Sustainable Solutions Showcase, an event attended by vendors, government officials, and consumers interested in sustainability.

Challenges of Green Shipping

As discussed above, initial efforts at greening shipping can be both easy and cost effective. But as the easy fixes get implemented, businesses are looking at considerably more complex strategic and technological solutions, and many of them may actually cost money rather than quickly add cost savings. While the EPA’s SmartWay Program states that most technological innovations pay for themselves in one to three years of use, investing in new resources, be they green supply chain personnel or new engines, takes a bite out of profitability. Despite the large percentage of logistics managers that express interest in environmental compliance when awarding contracts, 54% make no provision for the extra cost that may be involved. In the same survey, 80% of respondents said that the economic downturn would not affect their environmental goals, but only 17% said they would continue to pay more for green alternatives. The discrepancies in responses show the challenge of greening transportation; everyone supports it, but when profitability is impacted, commitment declines.

The timing of shipments can be an issue. Efficient manufacturing often requires companies to ship small inventories quickly; this way they respond to the market and don’t hold excess inventory. In contrast, a green supply chain would limit the number of shipments and ship larger, full shipments by slower transport, maximizing miles traveled. These are the tradeoffs that supply chain managers must address. Another major barrier is a company’s existing infrastructure. Once it has invested in wasteful packaging, or built a distribution center far from rail hubs, it is costly to make changes. Still, the benefit of a thoughtful carbon footprint audit is that going forward, companies can replace aging equipment and facilities with greener choices.



Best Practices

Many factors impact the overall GHGs emitted during transport. Air travel is considered the dirtiest, and trucking comes next. Railroads are the cleanest, and can move a ton of freight 400 miles on one gallon of fuel. Shipping is significantly cleaner than trucking, consuming 75-85% less fuel than trucks per ton hauled. Still, within these different modes of transport, innovative businesses are finding ways of reducing emissions. Reductions are not just coming from fuller trucks and shorter routes, but by companies looking across the supply chain in its entirety to understand where emissions savings can be found. One new trend is near-sourcing, which, as it sounds, is the practice of sourcing materials closer to home. For US businesses, this means looking within the US, as well as to Canada, Mexico, and Central America, for goods that might typically be sourced from Asia. While the cost of goods may increase, the financial and environmental costs of transport are weighed as well.

For any company that wishes to be proactive in managing the environmental impact of its transportation and logistics, the first step lies in quantifying its carbon footprint. By understanding how much carbon is being released through shipping activities, companies can then seek to reduce highly polluting domains. Although there are many companies that offer carbon footprinting services, one of the best-known tools is the Greenhouse Gas Protocol. The GHG Protocol is an accounting standard that helps companies define a corporate boundary for GHG emissions, set a baseline standard, and measure output. It is internationally accepted and works by trying to harmonize different standards of measurement. The GHG Protocol divides emissions into three scopes, depending on whether they are direct or indirect emissions. The indirect emissions include those from all aspects of the company's lifecycle that are outside of its control, such as supplier trucking or waste disposal.

It is impossible to talk about sustainability and supply chain management without mentioning Wal-Mart. In July 2009, the global retailer announced its plans for its Sustainability Index, a process that will ultimately allow it to measure and label the environmental and social attributes of every product it sells. Like a nutrition label, the index would provide easy-to-understand metrics that allow consumers to make informed choices. This massive and ambitious undertaking is not something Wal-Mart can or intends to do alone; rather, the company is working with a group of academics, researchers, suppliers, retailers and nonprofit organizations to gather information about the lifecycle of the products, from raw materials to disposal. The index will be built on an open source platform and shared widely. While Wal-Mart's initiative is not specifically focused on transportation, there is no question that when the massive retailer shines the spotlight on issues of sustainability and environmental performance, business as a whole responds. When the company looked at its own supply chain, it found opportunities to reduce both costs and GHG emissions. In 2008, new slimmer packaging on some toys allowed for 727 less ocean containers, ultimately saving \$3.5 million and 1,300 barrels of oil.

Trucking

Trucking makes up the vast majority of freight shipment in the US, and as such carries with it a hefty environmental price tag. Trucks run on diesel fuel, which contains tiny particles known as fine particulate matter. These particles pose serious health threats. In addition, diesel exhaust contributes to smog, acid rain, and global climate change. When the EPA refined heavy-truck emission standards in 2007 it also began offering resources on retrofitting older trucks. The result is that now trucking can be up to 90% cleaner. Because there are newer, cleaner options, trucking also offers many opportunities for relatively simple



changes that can have a large impact. Alternative fuels, idling reduction, route optimization, and retrofits all play roles in reducing fuel consumption. And while some of these issues require new technologies, others are best addressed through strategy and management techniques.

When it comes to shipping by truck, the first place for environmentally concerned companies to look is the EPA's SmartWay Transport program. This program is a partnership between the freight industry and the government, and it is focused on reducing GHG emissions and increasing fuel efficiency. The program includes shippers, carriers, logistics firms, affiliates, and truck stops. Companies that partner with SmartWay must commit to measuring and reducing their environmental footprint, and in return are able to take advantage of benefits that range from financing for technological upgrades to industry recognition. The program distributes "Excellence Awards" annually, looking at actual emissions reductions, as well as overall environmental performance.

For companies engaged in shipping activities, SmartWay offers tools and resources for improving environmental performance. For companies looking to contract with shippers, the SmartWay brand offers a way to ensure the contract will be undertaken in an environmentally responsible way. Choosing a SmartWay carrier allows companies to promote their focus on the environment and gain access to money-saving tools.

Rail & Marine Shipping

While SmartWay's solutions for reducing trucking emissions offer strong suggestions for some cost cutting and fuel cutting efficiencies, there are other ways in which companies are reducing the carbon footprint for shipping. Moving freight completely off of the roads is one option. Rail travel is a far more efficient way to ship, and according to the EPA it can

reduce fuel consumption and GHG emissions by 65% compared to trucking. By building distribution centers near rail hubs, companies can take advantage of these savings. Because of the potential savings, moving more freight to rail is a core SmartWay goal.

Globally, ships play a large role in transport, which is expected to increase with global trade. The impact of shipping is commensurately large. The international shipping community as well as federal and international regulators are looking at ways to address this issue. One solution is a tool called the Energy Efficiency Design Index. This tool would allow new ship designs to be verified against likely upcoming mandatory standards, allowing companies to be proactive in addressing impending legislation. More locally, in the US there is renewed interest in short sea shipping. The idea of creating short ocean lanes for coastal shipping has been around for many years, but it never had the needed backing to get off the ground. In 2007, however, legislation was introduced that would provide more support. As the Obama administration focuses on green transportation, it remains to be seen whether short sea shipping will become a viable alternative.

Shipping firms have been blamed for 3-4% of global emissions and have felt pressure from governments and public opinion to reduce carbon output. Critics contend that the reason behind the high level of marine shipping emissions is a combination of inefficient engines and the type of fuel that they burn. Marine shipping engines rely on so-called "bunker fuel," a heavy, dense type of fuel that is quite literally the bottom of the barrel. The only other petroleum-based product that is denser than bunker fuel is bituminous residue, used to pave roads and seal roofs.

While there is promising research currently underway which examines new ways to improve marine shipping engine & fuel efficiency – slide valves, emulsified fuels, water-in-fuel emulsification on demand,



diesel particulate filters, sea water scrubbing, etc (see Black Carbon Sustainability Watch Report) – Danish shipping firm Maersk has taken another approach to reduce carbon emissions. The company ordered ten new “Triple-E” class vessels from Korea’s Daewoo Shipbuilding and Marine Engineering Co. Ltd. The Triple-E ships are massive, and will be able to carry 20% more cargo because of their width (59 meters).

These ships will travel more slowly and recover waste heat saving up to 10% of main engine power and removing the need to burn fuel to keep essential decks climate controlled. According to Maersk, this 10% reduction equals the average annual electrical consumption of 5,000 European households. Maersk estimates that the ships size, slower speed, and efficient design will reduce fuel consumption by 50%.

Regulatory Environment

US Regulation

Historically, most of the regulatory environment affecting shipping and transport has come in the form of fuel economy standards and emissions levels, which are set by the EPA. This began under the Clean Air Act in 1965, and the only state to enforce different rules was California, which was granted a waiver for more stringent regulation due to its pollution problem. While states cannot make up their own regulations under the federal ruling, eleven other states have adopted the California standards. Recently, the EPA has finalized new clean fuel and vehicle emission standards, the 2008 Locomotive and Marine Diesel Rule, and the 2007 Heavy-Duty Highway Engine Rule. These new standards are expected to reduce particulate matter and other harmful pollutants by 90% or more. In addition to fuel efficiency and emission standards, 30 states and many municipalities have other regulations that pertain to aspects of transportation such as idling. The federal government has no anti-idling ruling, but the EPA does offer guidance on anti-idling technologies

and resources, such as grants.

With the new administration and an ever-increasing global concern about climate change, there is almost definitely going to be more regulation coming. 2009 has seen dozens of local, regional and federal proposals relating to cap-and-trade legislation on greenhouse gas emissions. While both industry and environmentalists agree that the country needs to reduce GHG emissions, there are expected differences of opinion. Recently, the Vice-Chairman of the American Trucking Association spoke out against potential cap-and-trade policies, stating that the trucking industry has no real options for reducing fuel use.

In late 2009, two climate change bills are making their way through Congress, and both would affect trucking and shipping. The American Clean Energy and Security Act (ACES), also known as the Waxman-Markey Bill, passed the House in June 2009, and the Clean Energy Jobs and American Power Act, also known as the Kerry-Boxer Bill, was introduced to the Senate in September 2009. Both bills set reduction targets for the US’s total GHG emissions, and both contain provisions for dealing with heavy-duty vehicles and transportation. The bills would require that the EPA add GHG emission standards for both new heavy-duty vehicles and engines, and new non-road vehicles and engines (such as ships and tractors). In addition to including carbon emission standards for heavy-duty vehicles, the new legislation could also increase diesel fuel costs through its cap-and-trade policy. The legislation does not specify how carbon allowances will be allotted, but opponents of the bill say that it would assess \$1.3 trillion in diesel fuel taxes.

International Regulation

With the next big meeting in international climate change happening in Copenhagen in December 2009, there is no question that international regula-



tion is also expected to increase. President Obama has announced his commitment to join international climate change policies, and there is a strong likelihood that the US will ratify the successor to the Kyoto Protocol. In some countries, legislation regulating corporate carbon emissions is expected to expand to include emissions from transportation activities before too long. By example, the UK's Climate Change Bill, passed in 2008, commits to reducing emissions by 60% by 2050, and the legislation includes components that would require companies to include carbon emission information in their financial reports. Proactive businesses will begin the challenging but potentially cost-saving process of measuring their carbon footprint in order to be ready for the more regulated global environment that is undoubtedly coming.

Related Entities

Environmental Protection Agency
 SmartWay Transport Program
 Greenhouse Gas Protocol
 Wal-Mart Sustainability Index

Acronyms

ACES: American Clean Energy & Security Act
 CO₂: Carbon Dioxide
 EPA: Environmental Protection Agency
 GHGs: Greenhouse Gases

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