Every day throughout North America millions of products are bought by consumers. A majority of buyers consider a company’s values and business practices when making a purchase. According to a recent study, 61% of consumers said their perception of a company is strongly influenced by the company’s environmental and sustainability policies.¹

Moving goods to market is a resource-intensive activity, but each component within the supply chain – manufacturing, warehousing, packaging, and shipping - presents opportunities to reduce both the carbon footprint and bottom line costs through improved efficiency and a focus on sustainability. It can be a daunting task to determine where to start and how to make the most meaningful impact, but the supply chain is unquestionably the point of entry where the impact will be felt most. Forty to sixty percent of the carbon footprint for a manufacturing company, and up to 80 percent for a retail business, can be attributed to its supply chain.²

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In addition to the inherent value in reducing and reversing damage that has been done by pollution, landfills, and excessive carbon emissions, there are four main reasons that logistics suppliers, carriers, and the businesses they serve should implement energy-efficient supply chain solutions:

### Cost Reduction

Energy prices can be volatile. Reducing energy and fuel use in the supply chain can lessen exposure to the risk of price shocks, ensuring a measure of stability and predictability. Carriers cannot control the market prices for energy and fuel, but they can innovate to do more with less, so that they and their customers will be less affected if prices spike.

### Government Regulations

Governments around the world have increased regulations by limiting carbon emission levels of business, and many have incentivized or subsidized energy-efficient practices.

### Customer Demand

Sustainability appeals to a growing segment of customers, who increasingly demand environmental responsibility from companies.

### Improved Productivity

Energy efficiency often results in improved productivity across other business functions. For example, some measures that increase fuel efficiency in a tractor trailer fleet also lead to less time in transit and quicker deliveries.

Like the supply chain itself, the success of sustainability depends on several discreetly managed functions working together toward a common goal. This white paper will explore options for realizing the environmental and financial benefits of sustainability through technology and best practices in transportation and freight, warehousing and distribution, and property management.

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### Industry Certifications

**LEED (Leadership in Energy & Environmental Design)** is a series of certifications offered by the U.S. Green Building Council to all types of buildings, both residential and commercial, in recognition of sustainable practices in design and construction, maintenance, and operations. LEED certification can be earned at any stage in the lifecycle of a building.

**Energy Star** is a voluntary Environmental Protection Agency (EPA) program that certifies and promotes energy-efficient consumer products and buildings as part of a broad effort to encourage businesses and individuals to achieve a smaller carbon footprint by lowering energy consumption. Buildings and goods may earn an Energy Star label if they meet certain targets for energy efficiency. Businesses seeking to increase sustainability and lower costs may seek out manufacturing processes and facilities, warehouses, and office spaces that are Energy Star certified.

**SmartWay** is the EPA’s program to reduce carbon emissions resulting from transportation within the supply chain. The program takes a multi-faceted approach, including grants to invest in new technology, ranking of vehicles’ performance, collaborating with shippers and carriers, creating incentives for companies that voluntarily meet benchmarks for fuel efficiency, and evaluation of methods and equipment.

**WasteWise** is an EPA program that helps businesses, local governments, and other organizations reduce their output of solid waste. Participants receive custom guidance and in-person technical assistance to help their facilities create less waste and recycle more of what waste they do generate.
TRANSPORTATION AND FREIGHT MANAGEMENT

Transportation costs make up about 63% of total logistics expenses. Trucking alone comprises about 48% of logistics costs, making it a priority focus area. Energy efficient improvements that lead to reduced transportation costs can significantly impact savings. Many new and emerging technologies and management practices are available to companies seeking to improve the sustainability of their trucking fleets. Companies that outsource trucking services should seek out vendors that utilize these tools.

Primary Metrics
The primary ways to measure the benefits of integrating sustainability best practices into the transportation function are fuel efficiency and air pollution. As carriers maximize their miles-per-gallon, they will also reduce the amount of carbon dioxide emitted. There are several ways to accomplish these goals, and the benefits beyond environmental impact include safer conditions for truck drivers and other drivers on the roads.

Technological Improvements
The tractor trailers that haul goods are complex machines that often feature multiple systems, such as refrigeration units for freight and sleeping quarters for the driver. Available technologies that help improve fuel efficiency on these indispensable vehicles include:

- Trailer Skirts are attached under a trailer between the landing gear and rear tires. They deflect wind and make the trailer more aerodynamic. Moving the airflow from underneath the trailer around the outside of the rear axles allows the engine to work less hard to achieve desired speed.
- The space between the cab and the trailer is a source of drag, which can impact fuel economy. The wider the space, the more drag is created, and the harder the engine must work. By using Trailer Gap Optimization, tightening this space as close as possible, the tractor’s aerodynamics can extend to the trailer, improving gas mileage.
- The combined weight of the tractor and trailer influences how hard the engine must work. By employing lighter containers and equipment, transporting heavier payloads reduces the total number of trips required to handle the freight and ultimately fuel usage.

Ensuring Proper Maintenance
- Some trailers are now equipped with an automatic inflation system that measures tire pressure and inflates each tire to a desired pre-set tire pressure as needed while in transit. The devices can be integrated on new vehicles, and can be retrofitted to existing fleets. Properly inflated tires are necessary for optimal MPG, and provide a safer ride, with better handling and traction on the road surface.

Aerodynamics and Equipment Enhancements

Alternative Power Sources
Alternative power sources that can provide power to auxiliary systems, preserving fuel for driving, and reducing overall fuel burn.

- Auxiliary Power Units (APUs) control temperatures of driver cabins while not idling and can be run with battery power, which avoids fuel burn during down time.
- Refrigerated Trailers with electric standby and tractor accessories can run on Shorepower, meaning they are plugged in when the diesel engines are not running.

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4 Ibid.
**Mechanical and Physical Equipment Improvements**

- Trucks can be pre-set to shut down if they idle too long, reducing emissions and wasted fuel. In addition to using the equipment that makes this possible, carriers can and should provide driver training that includes information about how and why to avoid idling for extended periods of time.
- Super single tires - these much wider tires can be used to replace the more common tandem tires on tractor trailers. This may reduce gross vehicle weight and may offer lower rolling resistance, both of which contribute to improved fuel economy.

**Intermodal Transportation**

For decades, railroads have been used in combination with truck hauling to cut the cost and carbon footprint of transportation. In 2008, refrigerated containers were introduced into the intermodal system. This development created significant new opportunities in several industries by making it possible to ship frozen, refrigerated, and other temperature-controlled goods to new, more distant markets with comparable speed and cost.

**Best Management Practices**

Thirty percent of fuel economy is affected by driver habits; for example, when and how to shift and brake, and conducting proper routine tractor trailer pre-trips. Therefore, driver training and maintenance practices can have a large impact on sustainability in practice. One of the major focuses of a driver pre-trip inspection is tire pressure. Properly inflated tires contribute to maximized fuel economy and need to be replaced far less often. According to a study conducted by the National Highway Traffic and Safety Administration, at 9% under inflated, tires lose 5% of life and 1.9% of MPG. At 31% under inflated, they lose 37% of tire life, 6.2% of MPG.

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5 National Highway Traffic and Safety Administration, Commercial Medium Tire Debris Study, December 2008
Educating drivers about the need for proper inflation is essential. Additionally, maintenance should include checking tire alignment every six months. Proper alignment extends tire life and fuel economy, as well as lower rolling resistance.

Fuel efficiency can also be affected by management of any regulatory processes necessary to move goods across international borders. Quick border crossings can greatly reduce the time that goods are in transit, saving spoilage, and positively reducing fuel costs.

**The Future**

Wider adoption of alternative fuels and power sources, such as natural gas and solar power, is the leading development that will further reduce the carbon footprint of transportation and freight. Natural gas holds the promise of becoming the next important clean fuel. However, there is a lack of needed infrastructure and, as an investment, the cost of upcharge and residual value of natural gas vehicles is too high or not yet known. Still, once these concerns are resolved, natural gas may save carriers and their clients about 40% of fuel costs. Running more miles per truck would increase the savings. Solar power is being pilot tested as a source of energy for auxiliary power units (APUs). If these tests are successful, solar energy can replace fuel and traditionally generated electricity as a power source during times when the truck is not being driven.

*Natural gas may save carriers and their clients about 40% of fuel costs.*

Future innovation in fleet management will include alternative scheduling. Managers should try to avoid rush hour traffic jams and other anticipated bottle neck areas, which drag down fuel proficiency. If this sort of scheduling can be accomplished within customers' delivery parameters, they can be beneficial.


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**The cold chain** is even more resource-intensive and adds the challenge of maintaining climate-control throughout the chain. In *Evolving the Cold Chain: Best Practices & Innovations* NFI discusses many energy-efficiency benefits in the cold chain such as:

- **Telematics** - The ability to remotely monitor, operate, or adjust each individual container while it is in transit.
- **Light tractors** - Reducing tractor weight is essential to increasing capacity and lowering fuel usage.
- **Container-on-flat-car (COFC)** - This method of intermodal hauling involves securely double-stacking refrigerated containers onto flat rail cars, nearly doubling the hauling capacity of a train.
- **Control ambient temperature** - Conditions outside a container influence conditions inside it. An energy efficient cold chain can adjust as conditions change to generate fuel savings, which benefits the environment and the bottom line.

For more information on cold chain sustainability visit [www.nfiindustries.com](http://www.nfiindustries.com) to download NFI's Whitepaper *Evolving the Cold Chain: Best Practices & Innovations.*
WAREHOUSING AND DISTRIBUTION

A 2011 industry survey indicated that 48% of warehouse facilities had a formal sustainability program in place. There is much room for expansion of these initiatives, and of those companies that reported not having a formal initiative in place at the time of the survey, 53% said it would be considered in the future.

Primary Metrics
The primary sustainability metrics in warehousing deal with energy-efficiency of the physical plant and reduction of waste. Second line savings include cost of recycling versus solid waste removal, and the cost of packaging materials. Many of the measures discussed below also contribute to improved worker safety and productivity.

Technological Improvements

Flourescent Bulbs
Replace incandescent, sodium vapor, and metal halite lighting with fluorescent bulbs and fixtures. These provide brighter light using less energy and bulbs last longer. Compared with incandescent bulbs, fluorescent bulbs last about six times as long and require 75% less energy to operate. They also produce far less heat, which improves safety, and may also reduce air conditioning costs over the long term.

Motion Sensor Lighting
Motion Sensor Lighting should be used throughout warehouses, where lights can be set to turn on when staff is present and can automatically turn off when there is no activity in an area.

LED Lighting
LED Lighting is optimal for external lighting needs as it provides brilliant light using less energy and the bulbs are long-lasting.

Proper Air Circulation
Air Circulation can be improved with strategic use of fans. These can augment climate-control and promote a healthier work force.

Upgraded Power Sources
Power sources for warehouse equipment such as forklifts and pallet jacks can be upgraded to provide energy savings.

• Rapid charge batteries take about 30 minutes to fully charge, as opposed to traditional batteries, which can take as long as eight hours. Ancillary benefits include lowering the total number of batteries needed in a warehouse (at a cost of about $5,000 per battery), eliminating a portion of landfill waste, and extending the life of each battery.
• Propane is the preferable fuel for equipment in a properly ventilated setting. It costs less, is more efficient than gasoline, plus it burns clean and uses no electrical power.

7 Material Handling Industry of America; ProMat presentation 2011.
8 EPA http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=LB
**Best Management Practices**

Workforce and materials management can bring sustainability to new levels. Best practices in a warehouse environment involve creating less solid waste and avoiding wasteful energy habits.

**Go Paperless**

Use email and other electronic platforms for communication, billing, and additional business functions. Only print when needed, and encourage double-sided printing when appropriate.

**Recycle**

Industrial and office waste such as paper, cardboard, plastic, aluminum, glass, and even appliances and electronics should be recycled. Many local governments offer incentives which provide a cost savings compared to paying for waste removal or dumping.

**Analyze Packaging Needs**

Choose materials that are recyclable or biodegradable. Choose quality materials in order to use less of them over the long term.

- High-performance stretch film can replace heavy-gauge packaging film for wrapping pallets. This can save thousands of pounds of plastic film each year, which has a ripple effect in the environmental benefits of less overall production and less waste.
- Biodegradable fill pillows for packaging can provide an environmentally responsible solution for filling packaging voids.

**The Future**

The future of sustainability innovation in warehousing involves green building and design methods for new facilities, and retrofitting existing spaces to make them more efficient. This should include a focus on bringing more solar and wind power into the grid in order to cut the pollution and cost associated with traditional power generation. There is also a great deal of space to bring the technological ideas mentioned throughout this paper - specifically alternative power sources for warehouse equipment - to scale.

Propane is the preferable fuel for equipment in a properly ventilated setting.
Leasing, construction, and space design are excellent venues for reducing the carbon footprint of the supply chain. Offices, warehouses, and other commercial spaces are places where business processes and habits may be redirected to significantly reduce costs and environmental impact. Changes can be made from the point of designing a building through to its operation and use.

**Primary Metrics**

The three goals of sustainability in commercial real estate are to build and develop properties using energy-efficient techniques, reduce the operating costs of buildings, and reduce the individual energy consumption of the people who will work in or visit it. Operational costs include electricity, water use, and waste management. Costs associated with individuals include waste management, thermostat settings, lighting needs, and geographic accessibility of the building.

**Technological Improvements**

Much of the same technology that improves energy-efficiency in warehouses can also be applied to office and retail settings. Interior and exterior lighting should be replaced with fluorescent and LED fixtures. These bulbs burn brighter, use 25% of the energy, and produce less heat. Office thermostats should be governed to produce a comfortable environment within an affordable optimal range. Solar and wind power should be considered as alternative power sources. In addition to being clean sources of power, excess solar or wind power can often be sold to local utilities, providing a new stream of income. Additionally, natural light through skylights and windows should be utilized as much as is practicable.

There are several steps to improve sustainability when constructing a new building. It is imperative to ensure that the roof is suited for solar panels, even in cases when no solar will be installed. It should be built to support the weight of panels to allow that as an option in the future. Additionally, the use of recycled concrete should be considered. It is ground on site and mixed into new concrete, in a step that saves money, time, and landfill waste. Companies get LEED credits for recycling concrete from demolition projects, and doing so is less expensive than paying to haul it from a demolition site, and less expensive than making or buying new concrete.

**Interior and exterior lighting should be replaced with fluorescent and LED fixtures. These bulbs burn brighter, use 25% of the energy, and produce less heat.**

**Best Management Practices**

Space and proximity can influence fuel and energy consumption, as well as a building’s operating costs.

**Public Transportation**

Commercial real estate should be acquired with access to public transportation when possible, and with an emphasis on accessibility to customers and commuting workers. The current trend toward next-day or even same-day delivery makes it essential for manufacturing, warehousing, and distribution centers to move closer to the consumer.
**Redevelopment**

Scarcity of available land to develop in dense population centers such as the northeast make it difficult to build new facilities closer to the population, so redevelopment is gaining popularity. Redevelopment is a way to transform existing, but out-moded, buildings into useable facilities in locations that make sense for businesses. Smart redevelopment that places businesses closer to consumers results in fewer overall miles traveled, averting a large volume of carbon emissions.

**Rightsizing**

Another way to save resources and build in an environmentally responsible way is to ensure that newly constructed buildings are “rightsized.” Rightsizing a building means ensuring that the finished building meets the true needs communicated by the user with no wasted square footage, and room to expand, if that need is forecast. A skilled engineering team has the ability to plan the square footage with space efficiency in mind. In some cases engineers can show a customer that the building they envision can be made somewhat smaller and still fit their needs. This results in lower utility and operating costs for the finished building, requires less materials to construct, and creates a smaller footprint for the site.

**Build Up**

Another way to achieve a smaller building footprint is to build taller buildings where this is legal and practical. A smaller footprint creates less water runoff because in cases where land is to be cleared, it requires fewer trees be cleared. Height regulation is a local decision, and some communities that want to encourage industrial expansion are allowing taller buildings.

**LEED Certification**

Many businesses have started opting for buildings that are built to LEED specifications, but which are not LEED Certified. While this is more difficult to verify compliance with LEED sustainability best practices, it provides many of the benefits of LEED certification without the cost and time investment required to secure certification.

**Reduce Waste**

Once a building is in use, there are many options to reduce office waste. As paper is so integral to reduce office waste. Businesses should consider paperless billing, and utilizing electronic communications in favor of printed paper, as well as double-sided printing and copying when possible. Disposable coffee cups can be reduced by encouraging reusable cups that can be brought from home or provided inexpensively. And offices should endeavor to recycle and to use recycled consumer products.

**The Future**

Office and real estate sustainability in the future will involve innovation in growing alternative energy, lighting, and waste management practices, as well as considering policies that allow staff to work from home in order to reduce personal consumption of fuel and energy.
Building Environmentally Responsible Supply Chains

Businesses should seek logistics providers that “walk the walk” - following best practices within their own operations, while simultaneously offering them to clients. Social responsibility is a core value at NFI, and one way this is manifested is through our commitment to sustainability in all service offerings, and within the company’s own processes. NFI is committed to continuous improvement of its fleet services, warehousing, and property management with a focus on environmental stewardship and careful use of clients’ budgets. Many logistics companies utilize some of the technology and practices discussed throughout this white paper, but NFI employs every single one. The results are remarkable:

• As an EPA SmartWay Transport Partner, NFI is rated in the top 20% for overall environmental performance for all SmartWay emissions metrics.

• NFI recycles 360 tons of plastic and 11,000 tons of cardboard each year.

• Plastic film usage was reduced by 57% by converting to high-performance stretch film.

• NFI operates facilities that run on solar power, including its corporate headquarters.

• To prevent damaged wooden pallets from going into a landfill, NFI has implemented a National Pallet Buy Back Program to recycle the broken pallets accumulated in its distribution facilities.

• NFI is running several natural gas trucks and conducting regional pilot programs to test the viability of natural gas trucks in those areas.

Our team is always researching and testing new ways to reduce fuel burn during tractor trailer down times. NFI pioneered battery powered auxiliary power units with engineers from a major manufacturer of commercial vehicles, and is currently working on a plug-in charging system for tractors at stops while in transit.

As the global population grows and international economies become further intertwined, the needs of consumers and businesses are expanding. Through the creation and widespread adoption of sustainability best practices, it will be possible to meet ever-growing global demand in environmentally responsible ways. NFI is proud to provide leadership in this direction, believing it is not only possible to build sustainable supply chains, but imperative.
For more information on supply chain best practices visit www.nfiindustries.com.