



The Green Freight Handbook

**A Practical Guide for Developing a Sustainable
Freight Transportation Strategy for Business**

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Environmental Defense Fund

Environmental Defense Fund (edf.org), a leading national nonprofit organization, creates transformational solutions to the most serious environmental problems. EDF links science, economics, law and innovative private-sector partnerships.

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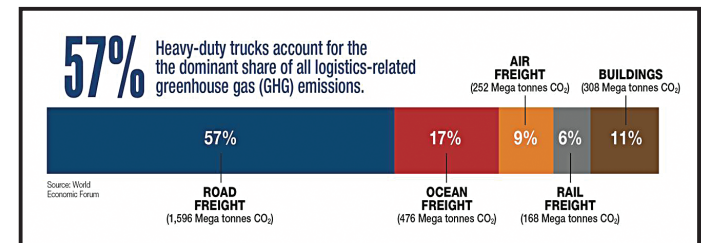
CHAPTER 1

INTRODUCTION

Our appetite for goods of all kinds—food, electronics, apparel, housewares – is growing. And the supply chains that make and deliver these goods are increasingly global. As a result, products travel farther to reach us than ever before, and that means greater fuel consumption, more greenhouse gas emissions (GHGs), and continued local air pollution challenges. In the U.S., freight transport accounts for 16 percent of corporate greenhouse gas emissions, making it one of the largest carbon footprint contributors.¹ Worse, freight’s contribution is set to grow. By 2040, U.S. freight emissions are on track to increase nearly 40 percent above current levels.² Meanwhile, compelling scientific assessments of climate change make it clear that society must dramatically cut greenhouse gas from all sources over this time. Reducing freight’s impact on greenhouse gas emissions is a major, long-term challenge for logistics professionals. Critical progress can be made, though, starting today.

On the broad issue of climate change, the world’s largest companies are stepping up to the challenge with real, committed action. In fact, more than 60 percent of the combined Fortune 100 and Global 100 have established public, GHG reduction goals.³ Freight has not yet reached center-stage status in corporate sustainability efforts, but that’s beginning to change, and for good reasons. Companies are recognizing the enormous potential of Green Freight strategies to reduce greenhouse gases and, at the same time, drive down costs and increase profitability. With Green Freight, there is a direct correlation between profitable business and environmental goals.

Through its work with shippers, EDF has identified five over-arching strategies that companies can employ today to significantly cut greenhouse gases and local air pollution, while driving business value.



EDF's 5 Principles for Greener Freight

- 1. Get the most out of every move.** Combine freight and adapt packaging to maximize cube utilization. A fuller move is a greener move.
- 2. Choose the most carbon-efficient transport mode.** Favor ocean over air, and rail over truck.
- 3. Collaborate.** Root out opportunities for savings through discussions with internal departments and with suppliers, customers, vendors – even competitors.
- 4. Redesign your logistics network.** Continually optimize your network to maximize cost savings and minimize greenhouse gas emissions.
- 5. Demand cleaner equipment and practices.** Urge your logistics service providers to use cleaner trucks and cargo handling equipment, and employ other air pollution-reducing practices at busy transport hubs.

These Principles for Greener Freight can help you meet both your freight efficiency and cost-cutting goals. The task now is for companies large and small to advance in their individual Green Freight journey. With widespread adoption of proven Green Freight strategies and performance-based objectives, freight shippers can make a meaningful contribution to reducing emissions. This Green Freight Handbook is designed to jumpstart the effort by offering a practical approach for getting started. EDF's 5 Principles serve as an underlying structure for this handbook, as we move through the steps of establishing metrics, assessing opportunities, and implementing a sustainable freight program.

For more information: www.edf.org/freight

Notes

1 Mathers, Jason, EDF, Analysis of U.S. Energy Information Administration Annual Energy Outlook 2012, Table 19. Energy-Related Carbon Dioxide Emissions by End Use. September 2012.

2 Ibid.

3 Calvert Investments, Ceres and World Wildlife Fund (WWF), Power Forward: Why the World's Largest Companies are Investing in Renewable Energy, December 2012.

CHAPTER 2

ESTABLISH METRICS

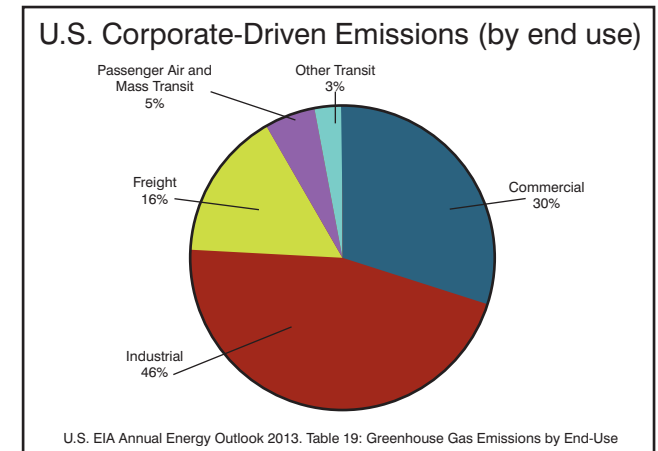
Establishing metrics is the first step in a Green Freight journey. Metrics signal that your efforts are focused on improving performance in a way that can be measured. They provide definition to your efforts and keep you from chasing one-off, check-the-box kind of projects that, while they may be newsworthy, don't tackle a core component of your freight's greenhouse gas footprint.

Well-defined, performance-based metrics keep transportation teams focused on the top Green Freight goal of achieving meaningful, measurable, cost-effective emissions reductions. Metrics also keep your team (and your executives) from confusing activity with achievement. For instance:

- Are you ready to sign an agreement with a carrier that has a new fleet of advanced trucks? This can be a great step, but if your empty miles double, is that progress?
- Are you under pressure to sign a new lease with a "green" certified warehouse? This could be a big win, but only if it doesn't add miles to your freight runs.

Just as a gym membership doesn't guarantee your ability to get fit, joining green clubs or purchasing green equipment doesn't guarantee reductions to your greenhouse gas emissions. Success in freight sustainability is about outcomes. It's about setting a performance target, and methodically monitoring results; tweaking behavior until the needle moves. That may not be worthy of a ribbon-cutting ceremony, but it's the formula for success – in achieving both operational and environmental gains.

Start your journey by establishing performance-based metrics, and report your progress regularly.



ESTABLISHING A FREIGHT SUSTAINABILITY METRICS BASELINE

- Identify the performance outcomes you are seeking to track. Be specific about the key environmental performance areas your company wants to impact. For Green Freight activities, this could be change in fossil fuel consumption and/or change in greenhouse gas emissions.
- Survey similar organizations. Find out what metrics companies in your industry are using to track Green Freight programs. Similar metrics might work for you.
- Establish absolute (overall) and normalized (productivity) metrics for these outcomes. Your operations will benefit from having two types of metrics: one type that tracks the overall direction of your efforts (e.g., Are your total emissions increasing or decreasing?) and another type that puts your progress in perspective by adding contextual measures (e.g., Are your emissions per mile or unit of product sold increasing or decreasing?). These metrics will become your key performance indicators (KPI).
- Collect historical data to establish baselines for absolute and normalized metrics. Identify as much data as you can access, including information from business partners such as carriers. It's important to have sufficient data to set a baseline. Then you'll want to choose one year as the baseline for future comparison. Make sure you pick a roughly representative year – not one in the middle of a recession or a boom.
- Ensure data is calculated in a consistent manner. All greenhouse gas calculators are not the same. There are dozens of different assumptions that can return very different results for the same freight volumes. Decide on the calculation approach that best fits your operations and stick to it, so you can usefully compare data from different sources.
- Institutionalize data collection processes. An efficient and transparent data collection process – preferably with secure electronic access to the necessary data – is critical to success, as is buy-in from your colleagues. Create a plan that specifies not only what new data will be collected and reviewed, but also the person responsible for collecting and reporting metrics regularly. Often, this will mean finding extra resources to support ongoing data collection.

What should you measure?

Your baseline will include both high-level freight sustainability metrics and more specific freight efficiency metrics.

High-level freight sustainability metrics

The three primary metrics to gauge freight sustainability, at a corporate level, are:

- Emissions per ton-mile – the average emissions associated with moving one ton of freight for one mile.

- Absolute freight emissions – the total greenhouse gas emissions generated by transporting freight.
- Total fuel consumption – the fuel used by direct freight operations and by third-party logistics companies (3pl) and carriers in the transport of products.

Freight efficiency metrics

Your success in reducing freight’s contribution to your company’s carbon footprint will be a result of the specific strategies you employ. You’ll want a more detailed level of metrics to assess progress in specific areas. Some of the more popular environmental performance metrics for logistics are captured in the chart below, modified from the Handbook on Applying Environmental Benchmarking in Freight Transportation.¹ You’ll want to focus on those metrics that are most relevant to your operation.

ENVIRONMENTAL PERFORMANCE METRICS

- | | |
|---|---|
| • Total emissions per \$ of revenue or \$ of purchases | • Total purchased truck and air miles per \$ of revenue |
| • Electricity consumption per \$ of revenue | • Percentage of transportation expenditure by mode |
| • Electricity consumption per \$ of purchase | • Percentage of revenue shipped by mode |
| • Total emissions per ton-mile or per shipment | • Percentage of ton-miles by mode |
| • Number of people exposed to specific concentration of emissions from facility | • Percentage of transportation miles by mode |
| • Percentage of SmartWay carriers | • Percentage of volume by mode |
| • Average score of SmartWay carriers | • Percentage of trips by mode |
| • Average miles traveled per shipment | • Average distance to shippers or receivers from nearest location |
| • Average emissions per shipment | |




How to calculate metrics and determine your baseline

The logical starting point for developing a sustainable freight program is to understand where you are today. Companies at the beginning stages of their Green Freight initiatives need to remember that ‘perfect should not be the enemy of good’ when it comes to establishing a baseline of their environmental performance. Highly detailed data-gathering and measurement may require time and resources you simply don’t have. In that case, rethink the scope of the program (by geography, by business unit, by mode).

Although it may seem like a lot of work to do before you've even started to make changes, bear in mind that the more accurate and comprehensive your baseline data, the better you'll be able to assess areas for improvement and – even better – demonstrate measurable progress down the line.

Greenhouse gas (GHG) emission levels are needed for several of the key environmental performance metrics listed on page 8. At the most basic level, there isn't anything complicated about calculating GHG emissions. Fuels contain carbon, which is released into the atmosphere as carbon dioxide when burned. If you know how much fuel you've used, you can determine most of your current GHG emissions. You can derive fuel volume by looking at how much freight you transport, the distance that freight travels, and the specific mode of transport used. Each mode will have its own emissions factor, since some modes are more efficient than others. A simple greenhouse gas emissions formula is:

GREENHOUSE GAS CALCULATION³

Greenhouse Gas Emissions =  **D** x  **W** x  **EF**

D = The **distance** your shipment has traveled (in miles or kilometers)

W = The **weight** or amount of your shipment (in pounds, kilograms or tons when data is available, or volume metrics such as number of twenty-foot equivalent unit [TEUs])

EF = The mode's specific **emissions factor**.

The distance and weight and/or volume information needed to calculate greenhouse gas emissions is most likely already captured in your transportation management software (TMS). Information on mode-specific emissions factors are generated by several sources, including the U.S. Environmental Protection Agency (EPA). A list of emission factors is included on page 10 and 11.

NORTH AMERICAN FREIGHT EMISSIONS FACTORS

Mode	Category	Functional Unit		Emission Factor	Greenhouse Gases Included	Source
Air	Longer flights (>3,700 km/ 2,300 miles)	grams per short ton-mile	Weight	868.3	CO2	A
	Shorter flights (<3,700 km/ 2,300 miles)	grams per short ton-mile	Weight	2,050.0	CO2	A
Barge	All	grams per short ton-mile	Weight	17.5	CO2	A
Ocean-Dry Goods	Asia to North America (east coast)	grams per TEU kilometer	Volume	68.1	CO2	B
	Asia to North America (west coast)	grams per TEU kilometer	Volume	59.1	CO2	B
	Mediterranean to North America (east coast)	grams per TEU kilometer	Volume	79.6	CO2	B
	Mediterranean to North America (west coast)	grams per TEU kilometer	Volume	76.8	CO2	B
	North America to Africa	grams per TEU kilometer	Volume	89.5	CO2	B
	North America to Oceania	grams per TEU kilometer	Volume	81.3	CO2	B
	North America to South America	grams per TEU kilometer	Volume	68.6	CO2	B
	North American (east coast) to Middle East and India	grams per TEU kilometer	Volume	77	CO2	B
	North Europe to North America (east and gulf)	grams per TEU kilometer	Volume	78.2	CO2	B
	North Europe to North America (west coast)	grams per TEU kilometer	Volume	69.6	CO2	B
Ocean-Refrigerated Goods	Asia to North America (east coast)	grams per TEU kilometer	Volume	95.3	CO2	B
	Asia to North America (west coast)	grams per TEU kilometer	Volume	87.9	CO2	B
	Mediterranean to North America (east coast)	grams per TEU kilometer	Volume	113.9	CO2	B
	Mediterranean to North America (west coast)	grams per TEU kilometer	Volume	112.4	CO2	B
	North America to Africa	grams per TEU kilometer	Volume	127.1	CO2	B
	North America to Oceania	grams per TEU kilometer	Volume	109.2	CO2	B

Mode	Category	Functional Unit		Emission Factor	Greenhouse Gases Included	Source
Ocean-Refrigerated Goods (Continued)	North America to South America	grams per TEU kilometer	Volume	102.1	CO2	B
	North American (east coast) to Middle East and India	grams per TEU kilometer	Volume	101	CO2	B
	North Europe to North America (east and gulf)	grams per TEU kilometer	Volume	107.6	CO2	B
	North Europe to North America (west coast)	grams per TEU kilometer	Volume	98.2	CO2	B
Rail	All	grams per rail-car mile	Distance	1,072.0	CO2	A
	All	grams per TEU-mile	Volume	292.8	CO2	A
	All	grams per short ton-mile	Weight	22.9	CO2	A
Truck	All	grams per mile	Distance	1,700.0	CO2	C
	Dray	grams per mile	Distance	1,750.0	CO2	C
	Expedited	grams per mile	Distance	1,200.0	CO2	C
	Flatbed	grams per mile	Distance	1,800.0	CO2	C
	Heavy Bulk	grams per mile	Distance	2,000.0	CO2	C
	LTL Dry Vans	grams per mile	Distance	1,625.0	CO2	C
	Mixed	grams per mile	Distance	1,700.0	CO2	C
	Refrigerated	grams per mile	Distance	1,750.0	CO2	C
	Tanker	grams per mile	Distance	1,750.0	CO2	C
	Truck-load Dry Vans	grams per mile	Distance	1,700.0	CO2	C
	All	grams per TEU-mile	Volume	597.4	CO2	A
	All	grams per short ton-mile	Weight	161.8	CO2	A

Source: A. EPA SmartWay: Shipper Partner Tool: Technical Documentation, 2013

B. BSR. Collaborative Progress: Clean Cargo Working Group Progress. 2013

C. EPA SmartWay: Carrier Performance for Public Export, 2014 (data is the median of each class)

CO2 VS GHGs

CARBON DIOXIDE (CO2) IS THE MOST PREVALENT GREENHOUSE GAS (GHG). On average, it represents more than 95 percent of the impact on climate change that comes from burning transportation fuels. Methane (CH₄) and nitrous oxide (N₂O) are other GHGs associated with fuel combustion. Hydrofluorocarbons (HFCs) – high-impact global warming gases – can leak from refrigeration equipment used to keep cargo cool. Because of its prevalence, some calculators measure carbon dioxide emissions only. This approach will underestimate the overall impact of your freight operations, but it can make for a simpler calculation. The inclusion of other factors can become particularly important when using alternative fuels, such as natural gas, which can result in higher emissions of methane. Emissions calculations that include all greenhouse gases associated with fuel combustion are often noted as a CO₂E factor – where “E” stands for equivalent. This means the warming impact of other greenhouse gases has been factored in.

Before we get into the nuances that can make some of these calculations more complex, let’s put our formula to work with a few straightforward examples:

Example: Calculating emissions from a truck-load move

Let’s start with calculating the emissions for a truck that travels 1,000 miles with 20 short tons of cargo (a short ton is 2,000lbs).

- **Step One:** Determine the total amount of ton-miles. Multiply 1,000 miles times 20 tons, which gives us a total of 20,000 ton-miles.
- **Step Two:** Get the weight-based truck emissions factor from the Freight Emissions Factors chart. This tells us that the average freight truck in the U.S. emits 161.8 grams of CO₂ per ton-mile.
- **Step Three:** Multiply this emissions factor with the total ton-miles {161.8 X 20,000}, which gives us a total of 3,236,000 grams of CO₂. Note that this calculation does not factor in emissions of other greenhouse gases, such as methane or HFCs.

- **Step Four:** Convert the total grams into metric tons. Metric tons are the standard measurement unit for corporate emissions of greenhouse gases. There are 1,000,000 grams in a metric ton. To convert our answer from step three we divide it by 1,000,000. This gives us 3.24 metric tons of CO₂ for this one move.

Here is the data we used in the previous example, plus another example for you to try:

Distance	Weight	Total Ton-Miles	Emissions Factor	Total Emissions	Total Emissions (Metric Tons)
1,000 miles	20 short tons	1,000 x 20 = 20,000	161.8 grams of CO ₂ /ton-mile	3,236,000 grams CO ₂	3.24 metric tons CO ₂
750 miles	13 short tons	750 x 13 = 9,750	161.8 grams of CO ₂ /ton-mile	1,577,550 grams CO ₂	1.58 metric tons CO ₂

Example: Calculating emissions from a truck-load with mileage-only data

Let's now consider an example where the shipper lacks access to tonnage data. It is possible to estimate emissions from this move, too – though it is likely to be less accurate than a calculation based on accurate weight or volume data. In our scenario, we have a truck traveling 1,000 miles again.

- **Step One:** Identify the appropriate distance-based truck emissions factor on the Freight Emissions Factors chart. In this example, we are using a truck-load – dry van service. Our appropriate emissions factor is: 1,700 grams of CO₂ per mile. This is the median score, based on the average weight of a full truck, for truck-load carriers participating in EPA's SmartWay program. One of the goals of the program is to allow shippers to identify their carrier-specific emissions factor, significantly improving the accuracy of the calculation.
- **Step Two:** Multiply the distance of the truck trip (1,000 miles) by the emissions factor (1,700 grams per mile). This gives us a total of 1,700,000 grams of CO₂.
- **Step Three:** Convert this into metric tons by dividing the total grams by 1,000,000. This gives us 1.7 metric tons. This is a significantly lower total than the weight-based approach above. As we highlight below in “Tips from the experts: Choosing and Using Emission Factors,” the embedded assumptions in each factor are very important. Fuel consumption, and therefore GHG emission, is going to be significantly different for shippers of toilet paper than tile – cargo weight is an important factor. It is best to choose calculation constants that best fit with your operations, and use them consistently – otherwise you'll compromise the integrity of your data.

Here is the data we used in the above example, plus another example for you to try.

Distance	Weight	Total Ton-Miles	Emissions Factor	Total Emissions	Total Emissions (Metric Tons)
1,000 miles	N/A	N/A	1,700 grams of CO ₂ / mile	1,700,000 grams CO ₂	1.7 metric tons CO ₂
750 miles	N/A	N/A	1,700 grams of CO ₂ /mile	1,275,000 grams CO ₂	1.3 metric tons CO ₂

Example: Calculating emissions from an ocean-truck, multi-leg move

We will now calculate a multi-leg, multimodal trip: the movement of a twenty-foot equivalent container (TEU) from overseas to a domestic distribution center (DC).

- **Step One:** Identify the origin and destination ports and calculate distance. In this example, the container will travel from Shanghai to the Port of Los Angeles, which is 5,699 miles or 9,172 kilometers.
- **Step Two:** Identify the lane-specific emissions factor from the Freight Emissions Factors chart. In this example, it is the Asia to North America (west coast) factor for dry goods – 59.1 grams per TEU-kilometer.
- **Step Three:** Calculate TEU-kilometers, which is 1 TEU multiplied by 9,172 kilometers.
- **Step Four:** Multiply total TEU-kilometers by emissions factor (9172 x 59.1g), which is 542,065 grams.

The container is transported from the port to a distribution center in the Inland Empire area of California.

- **Step Five:** Calculate the ton-miles. This trip is 75 miles with a load of 16 tons. The total ton-miles (75 X 16) = 1,200.
- **Step Six:** Multiply the total ton-miles by the weight-based truck emissions factor of 161.8 grams CO₂ per ton-mile, which gives us 194,160 grams.
- **Step Seven:** Add the truck leg to the total from the ocean leg (194,160 grams + 542,065 grams), which gives us 736,225 grams or 0.74 metric tons of carbon dioxide.

Here is the data we used in the above example, plus another multi-leg, multimodal example for you to try:

Example	Move	Mode	Trips	Distance	Weight	Volume	Total Ton-or TEU-Miles	Emissions Factor	Total Emissions	Total Emissions (Metric Tons)
1	Shanghai to Port of LA	Ocean (dry container)	1	5,699 miles/ 9,172 kilometers	N/A	1 TEU	5,899 TEU miles/ 9,172 TEU km	59.1 kg/ TEU-km	542,065 grams CO ₂	0.54 metric tons CO ₂
	Port of LA to Company DC	Truck (dray)	1	75 miles	16 short tons	N/A	1,200 ton-miles	161.8 grams CO ₂ /ton-mile	194,160 grams CO ₂	0.19 metric tons CO ₂
2	Manufacturing Facility to Rail Yard	Truck (dray)	2	35 miles	18.5 short tons	N/A	1,295 ton-miles	161.8 grams CO ₂ /ton-mile	209,531 grams CO ₂	0.21 metric tons CO ₂
	Long-haul rail trip	Rail	1	800 miles	37 short tons	N/A	29,600 ton-miles	22.9 grams CO ₂ /ton-mile	677,840 grams CO ₂	0.68 metric tons CO ₂
	Destination Rail Yard to Distribution Center	Truck (dray)	2	45 miles	18.5 short tons	N/A	1,665 ton-miles	161.8 grams CO ₂ /ton-mile	269,397 grams CO ₂	0.27 metric tons CO ₂

By the way, you can already see that rail transport burns a lot less fuel, and emits a great deal less GHGs, per ton-mile, than trucks, and that ocean transport can be even more efficient. We'll talk about this more later.

Key considerations when calculating emissions

Following the calculations above, you will be able to assess most of your current baseline activity and begin to track your performance-based sustainability metrics. As you move forward, you likely will need additional guidance on items such as:

- What is the scope of your calculations and where should you set boundaries?
- What are the best emission factors to use for your specific circumstance – type of freight, size of shipment, etc.?
- How should you allocate emissions when co-loading freight with other shippers?

Below is some guidance on how to tackle these considerations. At the end of this section, you will find several additional resources for more detailed guidance.

Scope of the calculations

Choosing organizational boundaries is an issue that will arise quickly. In a recent paper, MIT experts highlighted a standard that “provides a guideline for establishing a definition of transportation in the supply chain.”⁴ This standard is specifically written for freight shippers or cargo owners. Its recommended boundaries include:

- All vehicles used to perform the transport service, including those operated by subcontractors.
- All fuel consumption from every fuel source on each vehicle (i.e. include refer units auxiliary power unites).⁵
- All loaded and empty trips made by each vehicle.

The standard also has a list of items it considers to be out of scope. This list can be found in the NCFRP reference document, [Carbon Footprint of Supply Chains: A Scoping Study](#).

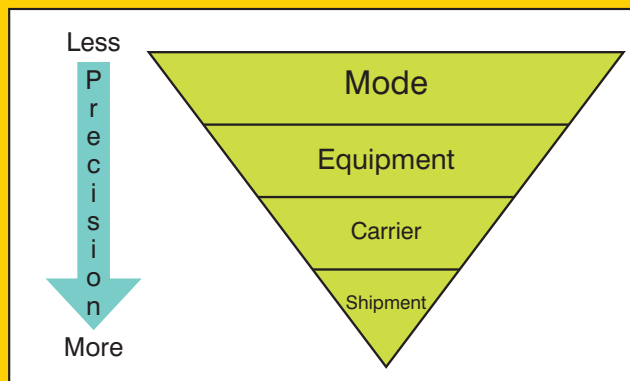
Best emissions factors to use

The emissions factors used for calculating supply chain freight emissions are activity-based factors. These aim to capture what a typical vehicle type uses in a typical operations cycle. To create this factor, reasonable assumptions must be made on emissions components such as the efficiency of the vehicle and the operating environment. Some factors are arrived at through detailed modeling; others are built by collecting survey data from carriers, such as through the EPA SmartWay Program. The best emission factors for your operations will depend on your unique circumstances and how precise you need your calculation to be.

TIPS FROM THE EXPERTS

CHOOSING AND USING EMISSIONS FACTORS⁶

- In choosing emissions factors, the more precisely the factor reflects your specific operations the better. The accompanying graphic depicts precision levels for emissions factors based on how they were created. Shipment-specific data is likely impractical. Whenever possible, use carrier-specific numbers.



- Understand how data was collected in order to come up with the emissions factor. Was it a model-driven, top-down approach, or a survey-built, bottom-up approach?
- Consider more detailed approaches, such as those put forward by the Network for Transport and Environment (NTM) in Europe. It publishes a comprehensive reference on CO2 calculations at various levels of detail that includes data requirements.
- Keep good records of your assumptions, and be ready to adjust your calculations as new data becomes available.

Changes in emissions factors will always impact absolute emissions reported, may or may not impact percentage emission reductions, and very rarely change final carbon-efficient logistics decisions.

- Understand which emissions are included in the emissions factors and which are not. Most factors include “direct emissions,” which are those associated with fuel combustion. Emissions associated with producing and processing the fuel – called “indirect emissions” – are typically not included. These emissions can be significant, and are particularly important to factor in when considering switching fuel sources.
- Given the global nature of our freight system, emissions factors and equations can appear in either metric or imperial units. It’s important to note the system used and convert the data as needed.

Allocating emissions when co-loading freight

Many companies have partnered to share space in trucks and railcars for increased efficiency and cost savings. When more than one company’s products are carried in a shipment, allocating emissions becomes more complex. To calculate the emissions produced by each customer’s product within the same truck, you must consider the size and weight of each pallet, the length of the total distance each product is shipped, and the amount of emissions the truck would produce if it were empty. The calculation you choose will depend on whether your shipments vary in distance, weight, and how much data you have available.

To illustrate the point above, let’s return to the first example we calculated of a truck trip of 1,000 miles with 20 short tons of cargo. Now, let’s assume that two companies are co-loading freight onto this truck. There are a few

ways they could allocate the truck emissions between them: by weight, by volume, or by share of the cost. When one company's freight is higher weight/lower volume and the other's is higher volume/lower weight (e.g. tiles and toilet paper), it's usually best to make the allocation using a cost-based method.

	Company 1	Company 2
Total Share of Weight	80%	20%
Weight-based Allocation	2.592	0.648
Total Share of Volume	40%	60%
Volume-based Allocation	1.296	1.944
Total Share of Cost	55%	45%
Cost-based Allocation	1.782	1.458

Additional resources

EPA SmartWay:

The **EPA SmartWay Program** is a terrific resource for freight shippers. By joining the EPA SmartWay Program, shipper members can assess carrier-specific data for many truck, rail and barge moves. Members also have access to a comprehensive emissions calculation tool created specifically for shippers. EPA SmartWay staff members provide technical support for companies filling out the SmartWay calculation tool.

Further guidance on calculations:

MIT Case Studies in Carbon-Efficient Logistics. These real-life case studies provide great reference materials for how carbon calculations are done for specific Green Freight initiatives.

- Ocean Spray: Leveraging Distribution Network Redesign
- Caterpillar: Light-Weighting and Inbound Consolidation
- Boise: Leveraging Rail Direct Service

DEFRA Guidance on Measuring and Reporting Greenhouse Gas Emissions from Freight Transport Operations. This document includes step-by-step calculation guidance for logistics service providers and carriers. It's created for operations within the United Kingdom. Calculations guidance can translate to the U.S. context, but emission factors are not valid for operations in the U.S.

Greenhouse Gas Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard. This standard, from the World Resources Institute, is the most widely used carbon accounting protocol for corporations. The framework includes specific guidance on most aspects of calculating emissions.

The Climate Registry: General Reporting Guidelines. This is a U.S.-focused corporate climate accounting framework, based largely on the World Research Institute protocol.

Carbon Footprint of Supply Chains: A Scoping Study. This is a detailed recommendation on the development of a complex carbon calculation tool. It's for those who want to dive in deep and get very precise with calculations.

- EN 16258 suggested boundaries (page 22)
- Review of existing freight carbon footprinting tools (page A-1)

Network for Transport and Environment (NTM). EU-based non-profit that established guidance on calculating the environmental performance for various modes of transport. The group offers a calculation method and relevant environmental data and tools for supplier evaluation.

Emissions factor resources:

EPA SmartWay Carrier-Specific Emissions Factors. For-hire trucking emissions factors by truck industry segment. Good for over-the-road emissions calculations.

BSR Collaborative Progress: Clean Cargo Working Group Progress. Maritime trade lane specific factors. Good reference if you are calculating emissions for international ocean cargo.

EPA SmartWay Shipper Partner Tool: Technical Documentation. Background information and emissions factors for U.S. freight operations.

Cefic ECTA: Guidelines for Measuring and Managing CO2 Emission from Freight Transport Operations. A source for emissions factors for European Union operations.

Other resources:

Carbon Footprint Study for the Asia to North America Intermodal Trade: Table 4 of this report includes distance between major Asian and North American ports

For more information: www.edf.org/freight

Notes

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3. Blanco, Edgar, Center for Transportation and Logistics, Massachusetts Institute of Technology, Delivering "Green," Case Studies in Carbon-Efficient Logistics. April 17, 2013.
4. Anthony J. Craig, Edgar E. Blanco, Christopher G. Caplice, Carbon Footprint of Supply Chains: A Scoping Study, NCFRP Project 36(04), June 2013. Massachusetts Institute of Technology Center for Transportation & Logistics.
5. EDF modified this phrase for clarity. The exact text from original text from the source document is: "all fuel consumption from each energy carrier used by each vehicle".
6. Modified from Edgar E. Blanco, Caterpillar: Light-Weighting and Inbound Consolidation, January 2013. Massachusetts Institute of Technology.

CHAPTER 3

ASSESS OPPORTUNITIES

There are many ways to reduce freight-related GHG emissions – mode choice, freight optimization, packaging design to name just a few.

But which strategies make the most sense for you?

This section of the Green Freight Handbook provides a framework to help you answer this question based on what initiatives will achieve the greatest environmental benefit in the least amount of time. It starts with EDF's 5 Principles for Greener Freight. These are proven strategies that are in use today by companies with active and successful sustainable freight programs. We'll review each principle, and provide real examples of how companies are leveraging that principle to reduce greenhouse gas emissions and operating costs. Then we'll present a Green Freight Diagnostic exercise – essentially a series of simple questions designed to help you determine which strategies are the low-effort, high-return opportunities – the low-hanging fruit in your freight sustainability program.

We'll present the Green Freight Diagnostic in the context of each of EDF's 5 Principles. You can download the full [Green Freight Diagnostic](#).



PRINCIPLE #1: Get the most out of every move



PRINCIPLE #2: Choose the most carbon-efficient mode



PRINCIPLE #3: Collaborate



PRINCIPLE #4: Redesign your logistics network



PRINCIPLE #5: Demand cleaner equipment and practices

PRINCIPLE 1:

Get the most out of every move

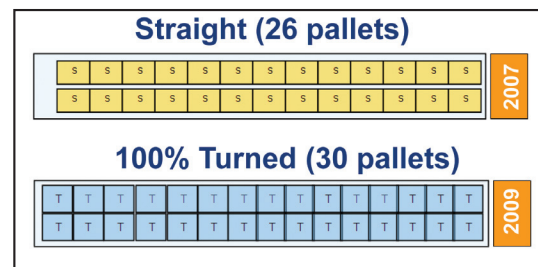


Whether it's a trailer, a container or a boxcar, better capacity utilization reduces the number of required freight runs. Transportation professionals recognize the business value of building fuller truck-loads. Yet, recent research has determined that 15–25 percent of U.S. trucks on the road are empty and, for non-empty miles, trailers are 36 percent underutilized.¹ Capturing just half of this under-utilized capacity would cut freight truck emissions by 100 million tons per year – about 20 percent of all U.S. freight emissions – and reduce expenditures on diesel fuel by more than \$30 billion a year.²

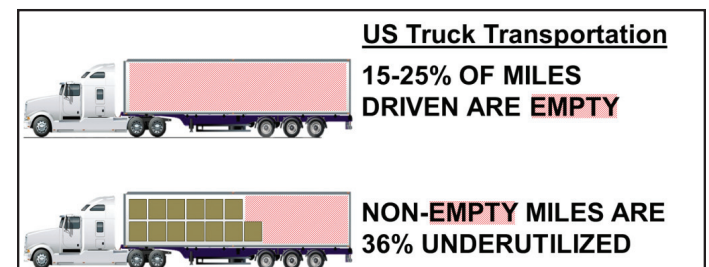
Nearly every company has the opportunity to improve its freight load factor. Realizing these gains and capturing the financial savings requires creative, system-level thinking and, sometimes, an information systems solution. Many leading companies are making impressive strides in this area.

KRAFT FOODS realized that, because of the variety of products either cubing-out trailers (reaching the volume limit) or weighing-out trailers (reaching the truck weight limit), its refrigerated outbound shipments were averaging only 82 percent of weight capacity. To address the problem, Kraft teamed with Transportation/Warehouse Optimization, a company that sells software designed to enhance efficiency. The AutoVLB software, also known as “Super Truck,” converts demand into optimized orders to maximize truck usage without damaging products. As a result, Kraft cut 6.2 million truck miles and reduced truck-load costs by 4 percent.³

WALMART was able to increase the number of pallets shipped in a truck from 26 to 30 simply by side loading pallets⁴. This is one approach the retailer has taken to achieve its goal of doubling the efficiency of its transportation operations by 2015. Other strategies that Walmart has employed to maximize cube utilization include grouping delivery days together, adjusting delivery frequency, improving systems, and educating local routers. Walmart’s senior vice president of logistics, Chris Sultemeier, noted: “Since 2008, we have delivered 335 million more cases while driving 300 million less miles⁵.”



Traditional loading of pallets compared with side loading in Walmart trucks



Homayoun Taherian, Cnergistics, LLC

Other companies have made capacity utilization a strategic priority, and literally changed their terms with customers.

.....
STONYFIELD FARMS developed new policies related to lead-time and minimum order size to ensure that its shipping containers were full. As part of its approach, the company worked with its clients to help them decrease the use of dunnage (inexpensive or waste material used to protect cargo during transportation), allowing the company to maximize the available space per trailer.⁶
.....

Sometimes the answer to more efficient freight operations lies outside freight operations. That's certainly the case with capacity utilization. How a product is designed and packaged has a major bearing on how much of it you can pack into a trailer. Different types of packaging include primary packaging (the widget), secondary packaging (the box of widgets), and shipping packaging (the master carton used to ship and store the boxes of widgets). Typically, packaging decisions are made with little input from logistics professionals. However, when logistics experts engage with colleagues in marketing, manufacturing and purchasing on smarter packaging choices, the company can yield financial and environmental benefits that can't be ignored.

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CATERPILLAR, the world's leading manufacturer of construction and mining equipment, gas turbines and engines, examined the inbound supply patterns for one of its plants and identified a big opportunity to cut carbon emissions by changing the type of packaging on inbound parts. The containers traditionally used to transport Caterpillar's huge component parts have been 235-pound steel containers, many in circulation more than 50 years. The company has been aggressively phasing out these steel containers and replacing them with plastic containers weighing 70 pounds. Caterpillar studies have determined that about 10 percent of existing inbound shipments could switch to the lighter weight containers, delivering a 16.5 percent reduction in CO2 emissions, or 130 metric tons per year.⁷
.....

.....
HEWLETT-PACKARD began selling a laptop packaged in a bag made out of 100 percent recycled fabric and a few plastic bags for consumers to re-use. This resulted in 97 percent less packaging than traditional laptop packaging. The company reported that it was able to fit three bags in a box to ship to the stores instead of shipping each laptop in its own box. This enabled 31 percent more product to fit on each pallet.⁸
.....

HOW PACKAGING CHANGES CAN MAKE FREIGHT OPERATIONS MORE EFFICIENT

According to the supply chain and packaging experts at Supply Chain Optimizers, whatever expense packaging represents of your company's supply chain costs, your transportation cost is six times larger. But many companies fail to consider how packaging decisions impact shipping efficiency and total costs. At most firms, packaging changes can cut 10 percent or more of the total costs of packaging, warehousing and transportation, while reducing GHG emissions. Supply Chain Optimizers offers the following advice for driving more volume through your existing freight capacity.

- Use more boxes, not less. Companies that have hundreds or thousands of products use a limited number of shipping boxes in the mistaken belief that using fewer boxes is less complex and ultimately cheaper. Ecommerce shippers are among the worst offenders, with the average firm using only 65 percent of the cube of outbound boxes. Total costs (boxes, filler, packing labor, freight) and carbon emissions actually increase as more packaging material and transportation services are used. Use box sizes that work for your shipment.
- Pay attention to density. Why? Because it's the #1 factor in setting less than truckload (LTL) and small packaging freight rates. Carriers have a required item density (weight per cubic

foot) and any package not meeting this threshold is billed on size rather than weight. Denser shipments translate into fewer trucks on the road.

- Avoid certain box sizes and shapes. Square boxes and cubes actually require more box material than rectangular boxes, with the flap material often exceeding that of the sidewalls. From a freight perspective, rectangular boxes are more likely to precisely fit a pallet. Square boxes result in more overhang (more damage) or underhang (poor utilization of trailer space). Think about matching the box with the freight containers they are going into – trailers, ocean containers, rail cars – which are all rectangles.
- Involve logistics in packaging decisions. Packaging is commonly seen as a marketing responsibility by Consumer Packaged Goods (CPG) firms, while industrial companies usually view packaging as an engineering exercise. Because of the far-reaching impact of packaging across the organization, it should always be a supply chain responsibility and must include input from logistics practitioners, who can advise on the cost and carbon implications of box choices.

GREEN FREIGHT DIAGNOSTIC

GET THE MOST OUT OF EVERY MOVE

KPI: LOAD FACTOR

The goal is to increase the load factor by reducing empty and partially loaded truck miles.

Data Required:

Average weight per shipment;
Average cube per shipment;
Cases delivered per gallon of fuel consumed

Questions	Strategies/Opportunities	Potential Benefit
Does your company have well-defined policies on lead-time and order size?	Having such policies helps plan truck-load shipments, leading to fuller trucks. Evaluate average cost per mile and average cost per pound by lane before and after to ensure savings.	Increase in utilization of trailer space.
Can your customers be flexible about arrival dates to enable freight consolidation?	With an automated transportation management system, companies can determine when there is an opportunity to hold orders for consolidation. Where feasible, and with the right incentives, companies can then send one larger shipment to customers instead of sending two smaller ones.	Reduction of product shipping volume by up to 30 percent.
Does your logistics team have input into shipping carton selection?	If yes, create recommendations for box size and shape changes that can increase cube utilization in trailers. For returnable packaging, aim to improve route stacking and collapsibility. This can reduce the need for underutilized backhauls.	Reduce product shipping volume by up to 30 percent.
Have you examined your purchasing patterns to ensure they are driving the highest degree of inbound freight consolidation?	By applying optimization to replenishment, and routing supplier shipments together, orders can be proactively aligned to create efficient, predictable multi-stop consolidations.	10 percent or more reduction in inbound freight cost, through increased utilization of inbound trailer space.

Questions	Strategies/Opportunities	Potential Benefit
Can you side load your pallets 90 degrees when loading them on the truck?	Explore the feasibility of side loading pallets to enable the loading of more cargo per truck. This will be feasible only for fleets that cube out, but do not weigh-out. This approach will require changes to pallet construction and loading.	8-15 percent increase in truck productivity.
Can you use load bars to create a second layer for product?	For truck-loads that cube out, but do not weigh out. Explore the possibility of using load bars that enable multiple stacks of pallets to be loaded on a truck.	Potential to increase truck productivity and decrease transportation costs and emissions.
Have you recently analyzed opportunities for balancing high density and low density products?	If no, explore how you might be able to better balance weight and cube constraints. Options include matching internal freight or co-loading with a company with a similar need and transportation lanes.	20-30 percent net reduction in process and resource costs.
Are you leveraging software to ensure trucks leaving your distribution centers are loaded optimally?	If no, examine product offerings available through various vendors. Many companies have been able to leverage these solutions to increase the utilization of each move. A manual starting point could be auditing the dock to assess load utilization.	4-8 percent cost reduction on outbound moves.
What inbound routes do you operate that could benefit from use of a load consolidation center?	Where feasible and beneficial, set-up consolidation operations, which can reduce the amount of trucks needed to move a given amount of freight.	3 percent or more cost reduction and similar greenhouse gas reductions.

Notes

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- 8 Bardelline, Jonathan, [HP Reduces Laptop Packaging 97 percent](#), GreenBiz.com, September, 2008.

PRINCIPLE 2:

Choose the most carbon-efficient mode



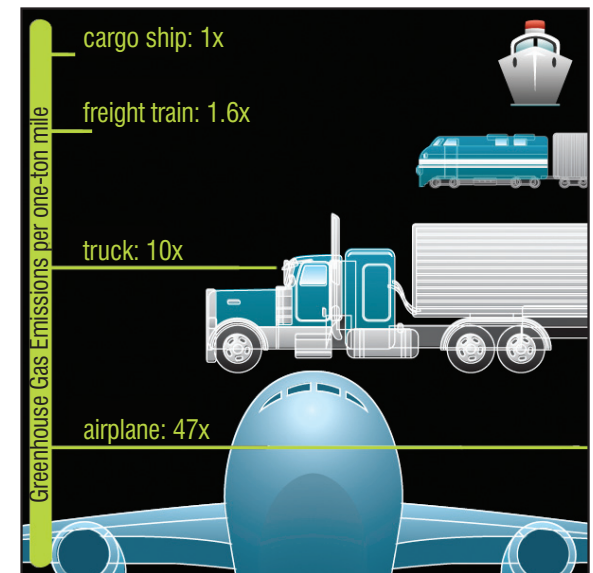
Choosing the most carbon-efficient mode may be the most impactful decision you can make in terms of carbon reduction. There is a significant difference in cost and carbon output between transport modes – air, ocean, waterways, rail and road.

Typically, the more carbon intensive option is also the more expensive one. Air freight emits 47 times more carbon per ton-mile than container ships, while costing 6.5 times more.¹ Because rail is about 3.5 times more fuel efficient than trucks, companies can lower costs at least 15-20 percent with intermodal rail based primarily on fuel savings.² In the past, some companies have steered clear of rail more because of concerns over service and reliability, but those barriers are disappearing:

- **Cross-country intermodal moves are more streamlined.** For moves that once required travel through multiple rail yards and contracts with different carriers, railroads now work together to share lines, share boxes, and execute moves under a single contract.
- **Service levels have improved.** Connections at rail yards are faster, and railroads are offering more truck-like networks, with service to all parts of the country.
- **Supply chain visibility has improved.** Major investments by rail companies in electronic monitoring technology is allowing shippers to track containers anywhere en route.

The environmental benefits from switches in transport mode are significant. If just 10 percent of truck shipments shifted to intermodal, one billion gallons of fuel per year could be saved in the U.S, reducing carbon pollution by more than 11 million metric tons every year.³

Ocean or rail transport won't be the best fit for every move, of course. But where use of those modes, or of intermodal services that combine them with air and truck are options, a strong business case can be made for these choices. Consider, for example, how the use of intermodal rail – which captures some of the cost and carbon benefits of rail moves and some of the flexibility of trucks – has skyrocketed in recent years.



Christine Daniloff/MIT News

JELLY BELLY CANDY CO. uses intermodal transport for all of its shipments from its main factory in Fairfield, CA to its primary distribution center in Pleasant Prairie, WI. This change saved the company \$500,000 in one year while its use of intermodal for these moves went from 30 percent to 100 percent. Plus, rail has matched the four-day transit times previously achieved via road shipment for 95 percent of the shipments.⁴

Intermodal rail has even become an option for some “expedited” shipments.

CONSTELLATION BRANDS makes heavy use of rail for long-haul shipments of wines and spirits. Historically, that did not include rush shipments required when distributors ran low after a busy weekend, but changes in rail service and the addition of “expedited intermodal” services have made intermodal a viable option, even for rush shipments. The company estimates that, for long-haul trips, the product gets there almost as fast as a truck, and at a much lower cost. Constellation’s savings estimates for rail: 40–50 percent on pure intermodal vs TL, and 20–25 percent on expedited intermodal vs TL.⁵

Some companies are having success with rail-only moves.

BOISE launched a Carload Direct initiative with a key customer, OfficeMax. This was possible because both the Boise facilities and OfficeMax facilities are accessible by rail. Through this initiative, more than 200 carloads were shipped via rail direct from Boise manufacturing facilities to OfficeMax distribution centers in 2011. The transition from using a mix of truck and rail to exclusive use of rail eliminated more than 2,600 tons of CO2 per year from Boise’s supply chain – the equivalent of saving more than 264,000 gallons of fuel.⁶

The railroad and trucking industries have been rivals for decades, but intermodal transportation has made them vital partners, too. Shippers can take advantage of those partnerships, using the best of both modes to gain maximum efficiencies.

Moving from air freight to ocean freight is also possible for time-sensitive and valuable products.

MICHAEL KORS, a leading designer of high-end handbags, proved that moving from air freight to ocean freight is possible even in the time-sensitive, high-fashion industry. The company used an innovative ocean freight service through OceanGuaranteed, a joint service provided by APL Logistics and Con-Way Freight. Since the volume of handbags was significantly less than the size of a typical container, Michael Kors needed a service that matched loads into full containers. This “less than container load” (LCL) approach historically added transit time. Unlike a full container, which can be transported directly from the destination port to a distribution center, goods traveling via LCL traditionally had to be unpacked and re-sorted upon arrival at a port before they could be transported to the final destination via “less than truck-load” (LTL) freight. Through their partnership, APL Logistics and Con-Way offered the designer a single-source option for LCL and LTL needs. The strategy helped the designer reduce transit time by 30 percent compared to standard LCL shipments. This change also cut carbon emissions and reduced freight costs by \$20 per bag.⁷

RAIL INTERMODAL⁸

- Consider intermodal when choosing a location for manufacturing or distribution sites. The farther you are from an intermodal facility, the higher the cost of drayage – and that offsets any savings from moving freight via intermodal.
- Adjust your shipment schedule to take advantage of railroads' shipping schedules. If a company ships out product in the morning, often the load will just sit at the rail terminal waiting to depart in the evening. Shippers can tighten transit times by 12 to 16 hours if they're willing to load and ship in the evening.
- Determine customer flexibility on arrival dates. They may be able to work with you to get to a more efficient, sustainable supply chain. It may even be possible to offer customers incentives that extend order-to-delivery windows.
- Frequently evaluate the advantages of intermodal compared to over the road (OTR) trucking for specific lanes. Consider multiple bids a year in order to take advantage of newly introduced freight rail service routes.
- Keep enough product in the pipeline. Since intermodal moves often take about one day longer than a truck move, it's tougher to get product out quickly if demand suddenly spikes.
- Use rail as a hedge against capacity constraints. New hours-of-service regulations are making it even tougher to find long-haul drivers.
- Don't forget about drayage. If the carriers hauling containers to and from intermodal ramps are unreliable, the advantages of intermodal rail can quickly disappear.

Choosing the most efficient option within your current mode is an effective strategy when mode shifting isn't feasible.

Participation in the [EPA SmartWay Program](#) enables shippers to access carrier-specific environmental impact data. These shippers are able to track the performance of the truck for carriers they are using. The transparent data system used by EPA SmartWay members enables participating shippers to effectively work with carriers to reduce emissions and create incentives for more efficient operations. Similar information is also available for marine carriers through the [BSR Clean Cargo Working Group](#).

GREEN FREIGHT DIAGNOSTIC

CHOOSE THE MOST EFFICIENT MODE POSSIBLE

KPI: MODAL USE BREAKDOWN

The goal is to increase the percent of total freight volume shipped on more carbon-efficient modes.

Data Required:

Ton-miles by each mode
 Total landed product cost
 All-in cost per pound for truck-load and intermodal moves
 Percentage of domestic trips greater than 500 miles traveled by rail (ton-mile)
 Mode and carrier specific on-time delivery percentage
 Order lead time requirements

Questions	Opportunities	Potential Benefit
Do you have access to fuel consumption data (contracts or owned assets), and a system in place to track the amount of fuel that is consumed in moving your freight?	If so, determine total fuel consumption by analyzing this data. When possible, ask carriers for direct fuel consumption data rather than estimates based on mileage.	Having a baseline and better understanding of fuel consumption can increase financial predictability.
Have you done an analysis within the last year that examines opportunities to move from truck-load to intermodal rail?	If no, conduct analysis to determine the cost, service and GHG impact of shifting a portion of your long-haul freight to rail.	20-40 percent reduction possible in transportation costs. Greenhouse gas emissions can be reduced by up to 60 percent.
Do you include both truck-load and intermodal as options on procurement bids, and request cost and lead time on both for comparison?	If no, consider including this information on new bids.	
Do your RFPs request information on all modal options?	If no, consider including this information on new bids to avoid “truck only” responses. Let carriers know you are open to mode shifting if it makes sense.	
Do you know who is responsible for authorizing mode conversion? Is authorization based on facts or perception?	If managed by perception, make sure the cost and service metrics are accurate and credible and included in the decision-making process.	

Questions	Opportunities	Potential Benefit
Is low volume a barrier to moving to rail from trucking?	If yes, reach out to your 3PLs and existing partners to see if there is a collaborative program you can participate in.	
Does use of air freight need to be authorized by an executive?	If no, create parameters for the use of air shipping and require that exceptions be approved by an executive.	Air shipments cost 6.5 times more than ocean shipments. Shifting freight away from air can cut transportation costs by tens-of-thousands to millions-of-dollars each year. Air shipments also emit 47 times more greenhouse gas pollution per ton-mile than ocean freight.
Is volume a barrier to shifting cargo to ocean freight from air?	If yes, explore an expedited less-than-container load arrangement.	
Are inventory holding costs a barrier to using ocean instead of air freight?	If yes, explore a value-added reseller approach where a third-party arranges the freight move and takes ownership of the cargo during the move.	
What freight moves could leverage barge shipping?	While barge transport is more prevalent in Europe, there are active barge options for U.S. shippers on many rivers and short-sea shipping routes. Evaluate all-in costs for barge moves and the alternatives.	
Do you require truck carriers to meet a certain SmartWay score?	If no, set a target performance score for all truck carriers.	Up to \$3.50 per 100 miles in reduced fuel surcharges based on the higher efficiency of elite carriers in the EPA SmartWay Program, compared to a carrier at the median level of fuel efficiency.
Is your truck-load fuel surcharge payment structure set up to reward carriers with higher fuel economy?	If no, consider establishing a baseline MPG assumption for all carriers. This will push less efficient carriers to adopt fuel-saving solutions, such as more aerodynamic tractor-trailers, while also rewarding carriers that are already more efficient. Revisit the baseline MPG annually.	Fuel costs for a truck that averages 6MPG will be \$6.00 less per 100 miles than a truck that averages 5.5 MPG. Greenhouse gas reduction of one ton/5,000 miles traveled on a 6PMG truck instead of a 5.5 MPG truck

Questions	Opportunities	Potential Benefit
Do you ask about the fuel efficiency of ocean freighters that ship your products?	If no, ask potential 3PLs to provide a regular report about the Environmental Ship Index (ESI) grades of the ships that carry your freight. You can also ask carrier participants in the BSR Clean Cargo Working group to share with you their specific trade-lane emission factors. When possible, choose the most efficient carrier available to carry your goods.	Up to a 24 percent reduction in fuel costs by choosing the most efficient marine carrier available.

Notes

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- 4 Douglas, Merrill, Intermodal Efficiencies, Inbound Logistics, October 2013.
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PRINCIPLE 3

Collaborate



The biggest breakthroughs in freight efficiency will come, not from the collective efforts of individual companies working separately, but from companies working together to ship the same volume of freight in fewer, fuller loads.

But that will require a shift in thinking. Companies that manage their own discreet supply lines must begin to view freight capacity as more of a shared infrastructure. Company-centric strategies, while they might be easier to manage, breed inefficiency.

- Partially full trucks today run side-by-side on the highway, even though they are travelling to the exact same retail distribution center (DC), and freight could have been combined.
- Outbound deliveries of full trailers ride alongside empty trailers returning home to the same destination after a delivery, even though the outbound shipper could have leveraged the opportunity presented by the empty trailer for an aggressive backhaul rate.
- Heavy and light products cause trucks to weigh out before they're full and cube out below the truck's weight capacity has been reached, creating inefficient trailer loads, even when the solution could have been as simple as combining shipments of cotton balls and hammers traveling along the same route.

Here are some compelling examples that clearly illustrate the power of collaborative freight strategies:

OCEAN SPRAY and TROPICANA. Ocean Spray was shipping products by truck from a manufacturing facility in New Jersey to a Florida distribution center. Both Ocean Spray facilities were a short distance from rail yards used by a competitor, Tropicana, which shipped orange juice north from Florida, via CSX Rail, in special refrigerated box cars. These box cars often traveled empty back to Florida. Tropicana's third party logistics provider (3PL) saw an opportunity for collaboration and proposed that Ocean Spray operate an intermodal lane from NJ to FL that would put Tropicana's empty cars to use. By going from truck to rail and taking advantage of ready rail capacity, Ocean Spray cut transportation costs more than 40 percent for that lane and reduced GHG emissions by 65 percent. Meanwhile, Tropicana reduced costs and GHG emissions associated with the return of the box cars.¹

SUN-MAID AND KANE. Sun-Maid is a medium-sized company that needs to ship with other companies to minimize LTL shipments, which can cost 3-4 times as much as a portion of a truck-load run. In the Northeast, Sun-Maid found a 3PL, Kane Is Able, that handles distribution for a large number of other consumer packaged goods companies shipping to the same mass retailers and grocery chains. By leveraging Kane's ability to consolidate Sun-Maid shipments with other like shippers, Sun-Maid saved 62 percent on the outbound freight costs for these consolidated shipments, while at the same time taking trucks off the road.²

DALTILE and WHIRLPOOL. Ceramic tile manufacturer, Daltile, a subsidiary of Mohawk Industries, and appliance maker, Whirlpool, both have manufacturing operations in Monterey, Mexico. Daltile's products are heavy. Filling a rail box car to its 200,000 lb. capacity left enough room for a 53-ft trailer. Whirlpool cubes out a box car at 35,000 lbs. Together, they devised a load plan that put the equivalent of four truck-loads (160,000 lbs) of tile in each box car, and then filled the rest of the box car with refrigerators. Each company now pays just 50 percent of the cost for the trip, but gets 80 percent of the maximum cube or weight capacity. Daltile's complete freight collaboration program, which includes multiple collaboration partners, generates \$3 million in annual freight savings and reduces diesel fuel usage by more than 600,000 gallons per year, eliminating 5,300-6,300 metric tons of CO2 from the atmosphere.³

TIPS FROM THE EXPERTS

MAKING GREATER USE OF COLLABORATION IN FREIGHT TRANSPORT

- Leverage 3PLs. Because they service multiple customers and are intimately familiar with customers' freight and shipping lanes, 3PLs are often in the best position to recognize when collaboration can occur. Make it clear to your 3PL and carrier partners that you seek collaborative shipping arrangements.
- Think long-term. Collaborative strategies can take longer because they involve decisions outside your sphere of control. But experienced freight collaborators report that the long-term Return On Investment on such initiatives are very attractive.
- Look to competitors. Your competition can make the best collaborators when it comes to efficient freight. Your products are likely going to the exact same customers and locations. While your products may compete on the store shelf, they don't compete in the back of a truck.
- Openly share cost information. When co-loading freight, two shippers agree to share the freight cost from the carrier. Mutual trust is critical to determine an equitable cost-sharing arrangement. Both companies must be transparent about what they are paying now and the benefits they will achieve through co-loading.
- Dedicate the required resources. One of the biggest reasons collaborations fall apart is a failure to put in place the resources required to manage the relationship. Often, it ends up as one more task added to someone's already over-full plate. Don't underestimate the time required to overcome differences in culture, terminology, and decision-making protocols.

GREEN FREIGHT DIAGNOSTIC

COLLABORATE

KPI: MILES TRAVELED IN A COLLABORATIVE NETWORK

The goal is to increase the volume of freight co-loaded with other shippers.

Data Required:

Ton-miles moved in co-loading arrangement
 Percent of ton-miles for replenishment stock that is sent via a shared network
 Total empty miles
 Load utilization rate
 Number of “troubled lanes”

Questions	Opportunities	Potential Benefit
Have you evaluated opportunities for co-loading arrangements with other shippers?	If no, work with other shippers and your 3PLs to identify additional opportunities for co-loading freight.	20-30 percent net reduction in process and resource costs.
If you measure transportation capacity in terms of volume, is density less than 5 pounds per cubic foot (pcf)?	If yes, this is probably a good candidate for weight/cube collaboration.	
If you measure transportation capacity in terms of weight, is density greater than 30 pcf?	If so, this is probably a good candidate for weight/cube collaboration.	
Do you maintain a list of “trouble lanes”, where costs are over-market, or volatile, or service levels are worse than market?	If no, develop such a list. Focus your initial search on collaborative shipping opportunities in these areas.	
Have you searched for shipper groups or consortiums that explore collaborative opportunities?	If no, reach out to other transportation professionals for advice on potential consortiums that would be a fit for your operations.	
Have you recently explored opportunities to match your freight flows with another shipper’s backhauls?	If no, work with 3PLs to map opportunities to leverage other shippers’ backhauls.	Savings of up to 30 percent per lane.

Questions	Opportunities	Potential Benefit
Have you recently explored opportunities to co-locate inventory and fully leverage possible efficiencies of a collaborative network?	If no, explore opportunities with your 3PL and distribution team.	10-30 percent transportation cost reduction.
Does your purchasing and logistics departments plan and manage according to a common set of freight efficiency targets?	Include truck utilization percentage, freight cost per case, and percentage freight under management as metrics upon which both purchasing and logistics performances are measured.	10 percent or more reduction in inbound freight cost, through new freight consolidation solutions from existing or new freight under management.
If you are in a Vendor Managed Inventory relationship with multiple customers, are you considering inventory replenishment patterns that will support multi-drop routes?	Utilize planning and optimization systems across VMI customers, rather than individually.	10-15 percent reduction in total outbound miles travelled across targeted customer locations, increased truck utilization.

Notes

1 Kruschwitz, Nina, [Ocean Spray, Tropicana team up on shipping to reduce emissions](#), GreenBiz.com. January 9, 2014.

2 Supply Chain Brain, [Freight Consolidation Program Pays Off Big for Sun-Maid](#), August, 2013.

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PRINCIPLE #4:

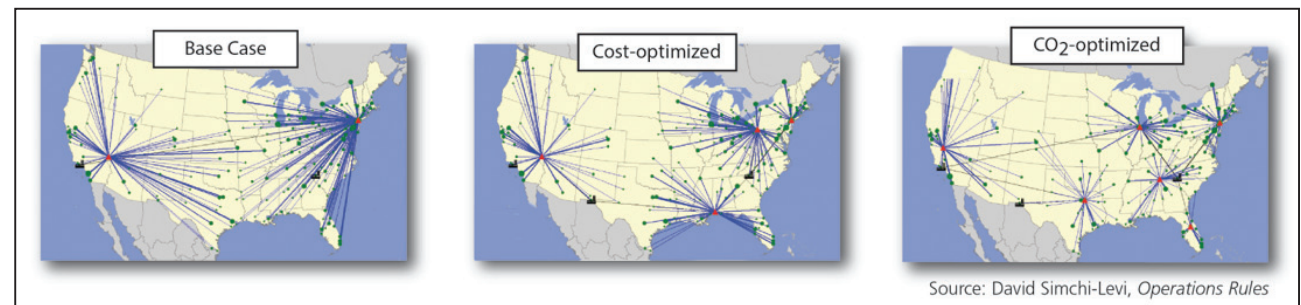
Redesign your logistics network



Reconfiguring your logistics network can have a dramatically positive effect on freight cost, fuel usage and greenhouse gas emissions. But it's a strategy that requires an extensive effort across the organization to gather, cleanse, analyze, and aggregate customer, supplier, inventory and transportation data.¹ Individuals responsible for sustainable freight programs should deliver clear results in other areas before tackling this resource-intensive task.

Traditional triggers for network optimization studies include M&A, business growth/contraction, expense reduction initiatives, changes to customer service level requirements and increases in fuel/transport costs. Historically, sustainability has not been a key driver. But that's changing. Today, more companies are factoring sustainability into their supply chain strategy. They want to know the greenhouse gas impact of strategic options and, increasingly, optimization studies are examining CO₂-optimized scenarios.

Trade-offs between cost, service and carbon efficiency are inevitable when making changes to your logistics network. While optimization studies may have been initiated for reasons other than sustainability, companies are reporting dramatic GHG reductions as a result of distribution network optimization.



OCEAN SPRAY added new manufacturing and distribution capabilities in Florida to support the company's growing customer base. To fully and effectively utilize these additions, Ocean Spray conducted a national network redesign project and determined that more than 17 percent of the total shipments would be served from the new facility. This redesign:

- Reduced the required miles for delivery by 4.5 million miles per year for the same quantity of product. The reduced mileage is estimated to save 14,000 tons of CO₂ per year, a 17 percent reduction in CO₂, with more than 70 percent of these savings coming from the Southeast region of the United States.
- Saved an estimated 10 percent in shipping costs by combining and reducing the number of shipments and distance travelled.²

Network optimization embraces much more than location choice. It can also involve decisions to streamline your supply chain by eliminating extra product touches and freight runs.

TUESDAY MORNING was shipping product from the Port of Los Angeles to the company's Dallas DC for deconsolidation and delivery to Tuesday Morning stores. The retailer worked with its transportation partner to develop a DC bypass strategy to ship a portion of the container volume direct to 337 of Tuesday Morning's 865 stores, avoiding the time, cost and emissions of the LA-to-Dallas leg. The strategy cut store distribution cycle time by two weeks and reduced supply chain costs by 19 percent. The company expects these results to improve as they shift more volume to the direct-to-store model.³

The drive to keep inventories low, particularly by retailers, requires vendors to send smaller shipments more often. This “just-in-time” strategy is challenging when it involves delivering products made thousands of miles away. Many high-tech products have a short shelf-life, and can quickly become obsolete. This leads to frequent, and often unplanned, use of expedited freight typically air, the least carbon-friendly mode. One solution to this inventory management challenge is “postponement,” where the final assembly of a product is delayed until just prior to shipment, and is performed closer to the final delivery destination, for example, at the DC. This allows more efficient, carbon-friendly inbound shipments, since shipping individual components takes up less space than finished goods that are already packaged. It also lets you better match supply with demand when forecasts prove inaccurate. The increasing sophistication of 3PLs is making mass customization possible, right on the warehouse floor.

CALIFORNIA INNOVATIONS, a global marketer of insulated coolers, was eager to increase supply chain efficiency by assembling products on-demand. Products are made of two primary parts – soft-sided collapsible cooler bags produced in Asia and rigid liners made in California. The liners are what give the product its size and bulk, so final assembly, which used to be done by an outside packager, is done by a 3PL at the distribution warehouse. There, trained associates insert liners into the bags. By postponing final assembly, this small but growing importer saves \$500,000 annually in freight and storage costs, and eliminates shuttle runs between the packager and the DC. Also, decisions on which of the 1,000 SKUs to assemble are based on actual retail demand. Products are created and immediately shipped, not stored.⁴

Network optimization does not have to be a large-scale event. Your logistics network can benefit from regular assessments of network efficiency. At the root, it involves frequently running “what-if” scenarios for warehouse locations, shipping routes and transport mode choices.

KEYS TO SUCCESSFUL NETWORK OPTIMIZATION⁵

- Involve top-level executives early. You don't want them to challenge your assumptions three months into a four-month project.
- Consider the proximity of rail terminals when choosing final locations. Some optimization tools may miss this key element and the significant role that rail can play in reducing overall costs and GHG emissions.
- Don't forget your inbound supply chain. Inefficiency here can add thousands of unnecessary truck miles, particularly if a large number of vendors are managing their own lines of supply to your site.
- Get cross-functional input. Managers from sales, purchasing, product development, sustainability, marketing and other disciplines are all internal stakeholders, and have valuable perspectives that can contribute to the project's success.
- Use a proven network modeling tool. The tool helps examine the cost and service implications of different strategic alternatives by quickly calculating "what-if" outcomes.
- Take your time. A typical network optimization project can take up to six months to execute well. When millions of dollars are at stake, along with the potential to drive millions of costly and polluting miles out of the supply chain, don't take short cuts for the sake of a few weeks.

REDESIGN YOUR LOGISTICS NETWORK

KPI: EMISSIONS PER TON MILE

The goal is to optimize your network to minimize emissions from freight.

Data Required:

- Load Utilization Rate
- Modal-use breakdown
- Miles traveled in a collaborative network
- Average distance of shipments
- Total amount of empty miles
- Average cost per pound by lane
- Average cost per mile by lane points

Questions	Opportunities	Potential Benefit
Can your distribution network be modified to enable greater use of rail and ocean freight?	Develop a plan for longer-term actions that modify your network to enable increased use of efficient modes. For instance, moving your distribution centers from an area that cannot utilize rail to a rail-served region might allow you to drive down both freight costs and carbon emissions.	25-40 percent reduction in transportation costs for affected lanes, from use of more efficient modes. Carbon reductions of up to 60 percent are possible too. Mode shifts can also be good fodder for articles and stories in Corporate Social Responsibility reports.
Can distribution locations of different business units be consolidated?	If yes, this could enable shipment conversion and reduced miles.	Potential fuel and emissions savings.
When was the last time a network analysis was conducted?	Complex networks may benefit from conducting this analysis on a bi-annual basis.	
Can you reduce inbound miles through use of a consolidation center or the implementation of a “milk-run” system?	Consolidation centers and “milk-run” systems both take many small loads and combine them into fewer, fuller loads. Analyze your inbound freight to identify opportunities to increase the load factor of these shipments. Evaluate average cost per mile and average cost per pound by lane, before and after, to ensure savings.	Up to 35 percent reduction in costs for impacted moves.

Questions	Opportunities	Potential Benefit
What opportunities exist to reduce the total truck miles needed to service customers?	Perform a network analysis that examines the cost and mileage implications of various strategies, including adding or consolidating distribution locations, changing primary ports of import, and increasing product mixing.	Cost and greenhouse gas emission reduction between 5 percent and 15 percent.
Is your process for eliminating errors optimized?	Steps such as cross-checking of entered orders and cross-checking what was picked can save you from shipping the wrong product.	Cut fuel and emissions waste caused by incorrect product shipping, which leads to returns and expedited shipping for the corrected order.
Have you reviewed your direct-to-client or direct-to-store transportation policies recently?	Identify products that can economically skip some stages of your distribution network, or bypass it entirely and instead be sent directly to the customer's distribution network or retail outlet.	Distribution center bypass can significantly reduce road mileage and cut up to 10 percent of the cost of goods sold.

Notes

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3. Schulz, John, Tuesday Morning's DC bypass cuts two weeks, 19 percent cost out of supply chain. Logistics Management, April 23, 2012.
4. Case Study, Just-In-Time Strategy Helps California Innovations Speed Time to Market, Reduce Freight and Storage Costs, Weber Logistics.
5. Logistics Management, Six Tips for Optimizing the Distribution Network, July 2011.

PRINCIPLE #5:

Demand cleaner equipment and practices



Emissions from transportation vehicles and logistics operations can contribute significantly to unhealthy air quality. The major emissions of concern are diesel particulate matter (DPM), which leads to asthma and respiratory illness, and nitrogen oxides (NOx), which form ozone. These emissions are of particular concern in densely populated areas that are often exposed to a number of pollutants.

The health impacts related to these emissions are staggering: increased rates of respiratory illness and asthma, cardiovascular disease, heart attacks, strokes, emergency room visits, and premature death. The U.S. Department of Health and Human Services recently found that “exposure to diesel exhaust particulates is reasonably anticipated to be a human carcinogen”¹. For the more than 13 million people in the U.S. that live near major marine ports or rail yards², these emissions come with heavy economic and health-related costs.

In fact, a 2009 study³ found health costs of \$153 million a year as a result of emissions from truck diesel pollution at the Port of Oakland. Across California alone, the health costs associated with diesel fuel – largely consumed by the freight sector – runs into the billions⁴.

Workers are at risk too. A study evaluating occupational exposures of DPM and other emissions found port employees and truck mechanics were often exposed to PM levels that are well above the exposure guidelines issued by the World Health Organization⁵.

It is more challenging for shippers to tackle emissions of DPM and NOx in their supply chains than greenhouse gas emissions. Given the immediate human health implications of these pollutants, however, reducing them should be part of every Green Freight action plan. These emissions are largely associated with older diesel equipment: cargo handling equipment, marine vessels and pre-2010 trucks. To make a real difference in this critical area, the entire community of shippers must encourage – through questions and incentives – supply chain partners to use cleaner-burning equipment, keep proper maintenance schedules,⁶ and enforce smart operational policies such as no-idling and slow acceleration.

Activities aimed at behavior change have the lowest barriers to implementation, as they tend to have low upfront costs and require few organizational resources. Companies can encourage behavior change internally, of course, but they can also incent carriers, third party logistics providers (3PLs) and customers by rewarding improvement in sustainability performance with more business, greater commitment, or faster payment, for example. Here is an example:

.....
LOWES, TARGET, HOME DEPOT and several other companies worked with EDF and the U.S. EPA to create the EPA SmartWay Drayage program. Through the program, private sector investment is generated to deploy clean technology and improve the environmental quality of our nation’s port communities.
.....

Steps can also be taken at distribution centers:

WALMART recently signed a deal with the company Plug Power to deploy 1,738 zero-emission, hydrogen fuel-cell forklifts in its distribution centers⁷. Their initiative is the most recent in a growing trend in warehouses, where companies including Sysco and FedEx, are deploying zero-emission fuel-cells in material handling applications. Many of these projects have been funded by federal grants to help accelerate the commercialization of promising innovative technologies⁸.

Reducing the environmental health impacts of these freight pollution hot spots will require more groups to work together. Shippers can help push forward “win-win” solutions that enable their carrier partners to make the capital investments necessary to replace older equipment with equipment meeting the latest environmental standards. These actions are in the business interest of shippers because it improves the lives of current and potential customers. These actions also help to promote the image of a shipper as a clean air partner in the community as well as help build the business network for future collaborations in other areas. Cleaner ports that have made the investments in modern equipment are more productive. Steps that are good for clean air, such as outfitting wharves with shoreside electrical power to allow ships and harbor vessels to plug in, developing efficient on-dock rail with cleaner switcher locomotive engines, and deploying zero/low emissions yard equipment, are good for worker productivity and health.

As shippers, you partner and contract with a number of service providers to transport your goods in and around hotspots. Ultimately, these service providers, including port authorities, drayage carriers, rail carriers, are the entities that are able to directly reduce emissions. You, however, play an integral role in working collaboratively with these partners and incentivizing their clean air actions. Whether you are negotiating contracts, strategizing your transportation needs or working on a common issue of interest, you can help ensure that your service providers are leading the way in cleaning up hotspots. Ask them about their commitment to local emissions reductions, new technologies they are deploying, opportunities to partner on grant applications, active practices to reduce emissions such as idle reduction, and emission reduction goals and metrics.

Your asset or non-asset based 3PL provider is also an important partner in clean air efforts. They can also answer many of the questions posed to other service providers. In the case of non-asset 3PLs, you can partner with them to engage the final service providers. The network of shippers, service providers and 3PLs all need to be on board to ensure a successful hotspot cleanup program.

CLEANING UP EQUIPMENT AND PRACTICES

- Know the footprint of your operations. A successful air pollution improvement plan will prioritize action in a few key areas. The impacts of the diesel particulate matter (DPM) and oxides of nitrogen (NOx) that contribute to unhealthy area quality are localized. This differs significantly from greenhouse gas emissions, which have a global impact. Because of these local effects, DPM and NOx emissions occurring in the vicinity of communities or in areas where there are already air quality challenges are critical to reduce. Start by targeting emissions that occur in high-population areas that have existing challenges in meeting healthy air quality standards; in highly urban areas, further assessment might include identifying sensitive populations in the vicinity of your operations, such as schools, neighborhood parks, or senior centers.
- Leverage existing programs. Successful programs for mitigating DPM and NOx emissions exist in many areas. Look for opportunities to coordinate your actions with existing initiatives such as the EPA SmartWay Drayage, Department of Energy's Clean Cities program, and the local metropolitan area council of governments (COGs). By partnering with these groups, you can gain access to knowledge and resources to more efficiently and effectively cut these harmful emissions. Your participation can help these groups too, as they can aggregate the impact of the actions and more effectively demonstrate the strong interest in air pollution mitigation efforts.
- When possible, act in concert with other shippers to magnify your impact. Reach out to other shippers with significant, overlapping air pollution footprints in your priority areas. Consider how you could jointly work with key service providers and facilities to enable them to move to cleaner equipment.
- Consider joint bids for government grants. Public funding is available in many geographic areas for innovative programs to cut emissions that contribute to unhealthy air quality. The funding prospects of proposals can be greatly enhanced when a key shipper is committed to participating in the effort. By participating in SmartWay, Clean Cities, and your local COG initiatives, you are more likely to be aware of opportunities for funding and partnering with others.
- Create goals for both your direct footprint and supply chain. The majority of your localized air pollution footprint likely comes from your supply chain. Because of this, most of your efforts to reduce this impact will target the operations of your key service partners. Establishing goals and undertaking mitigation efforts for your direct footprint, such as emissions at distribution centers, will help your team better understand how to implement local air-quality mitigation efforts and will increase your credibility on this issue with your key service partners.

CLEANER EQUIPMENT AND PRACTICES

Questions	Opportunities	Potential Benefit
<p>Have you identified marine ports, transport hubs or warehouses in your freight network that are located in air pollution hot spots?</p>	<p>If no, map your logistics and distribution system against the U.S. EPA non-attainment maps for criteria pollutants, such as PM 2.5 and ozone. The overlap between maps will be the key air pollution hot spots in your distribution system. Work with your supply chain partners to advance clean-up plans for freight operations in these areas.</p>	<p>Reduce long-term risk of costly network redesign due to community pressure on operations and growth of existing facilities due to air pollution.</p>
<p>Are you leveraging “green lane” programs for cleaner trucks?</p>	<p>If no, assess which ports in your network are operating these programs and which dray providers meet the criteria to participate in the program. Encourage ports without existing “green lane” programs to create such a program.</p>	<p>Dray providers participating in “green lane” programs are able to complete more turns in a day – improving their service time and profitability. These programs push more drivers to cleaner trucks – thus reducing emissions per mile of operation.</p>

MARINE PORT PARTNERS

KPI: PERCENTAGE OF MARINE PORT FACILITIES TRANSITED BY YOUR CARGO THAT HAVE AIR POLLUTION MITIGATION PLANS.
The goal is to increase this percentage.

Data Required:
Ports of entry
Air quality attainment status for marine port locations
Percentage of TEUs moved through a port with a criteria emissions mitigation plan

Questions	Opportunities	Potential Benefit
Do the ports through which your cargo moves regularly measure and report environmental impact mitigation efforts? Are they participating in programs that help them identify current best practices and work with their stakeholders on emissions reduction projects?	If no, request ports complete and publicize a comprehensive emissions inventory and implement projects to reduce emissions, based on best practices. Ports that are participating in programs such as ISO 14001 and other environmental measurement and/or recognition programs have demonstrated a commitment to reducing emissions and improving the sustainability at their port.	Reduce long-term risk of supply chain disruptions that result from the inability of key facilities to expand because of significant community pressure for air pollution mitigation efforts. Ports are often a significant source of emissions that can influence the attainment or nonattainment status of a region; a lack of progress towards meeting air quality standards can have financial repercussions to a region (and its local businesses), as federal highway funding could be lost.

RAIL PARTNERS

KPI: PERCENTAGE OF RAIL FACILITIES TRANSITED BY YOUR CARGO THAT HAVE AIR POLLUTION MITIGATION PLANS.
The goal is to increase this percentage.

Data Required:
Location of rail yards
Air quality attainment status for rail yard locations

Questions	Opportunities	Potential Benefit
Is your rail service provider using the cleanest rail and infrastructure technology at their switcher yards?	If no, explore the opportunities available to you and your service provider to work together and deploy cleaner technology.	Cleaner technology means fewer emissions and improved local air quality.
Is your rail service provider using automated gate systems at their yards?	If no, consider partnering with other shippers to secure funding for these systems.	Automated gate systems often result in faster turn times for trucks entering the yard.

DRAYAGE PARTNERS

KPI: PERCENTAGE OF DRAYAGE MOVES THAT USE 2010 OR NEWER TRUCKS
The goal is to increase this percentage.

Data Required:

- Location of marine ports and rail yards served by your drayage providers
- Air quality attainment status of areas where these ports and rail yards are located
- Percentage of dray moves on pre-2010 trucks
- Percentage of dray moves by EPA SmartWay Dray fleets
- Drayage truck turn times (overall)
- Drayage truck turn times (chassis component, if available)
- Number of trips needed only to pick up different chassis

Questions	Opportunities	Potential Benefit
Have you identified where you are hiring drayage services to transport goods into or out of ports or rail yards located in air pollution hot spots?	If no, map your logistics and distribution system against the U.S. EPA non-attainment maps for criteria pollutants. The overlap between maps will be the key air pollution hot spots in your network. Work with your supply chain partners to advance clean-up plans for freight operations in these areas.	Reduce long-term risk of costly network re-design due to community pressure on operations and growth of existing facilities due to air pollution.
Do you require drayage drivers to operate 2010 or newer trucks?	If no, add "Clean Truck" requirement to dray bids. 2010 and newer trucks reduce harmful emissions by 90 percent over older models. Several regions have low-interest loan programs for drayage drivers to move into cleaner trucks.	Compared to mid-90's trucks, 2010 or newer trucks will result in 90 percent less emissions of particulate matter and oxides of nitrogen. Additional benefits: increased service reliability and potential access to financial incentives.
Are you leveraging cleaner fuels with your carrier partners?	If no, explore the opportunities available to you and your service providers to work together and deploy dray trucks that run on cleaner-burning fuel. When choosing between fuels, it is important to consider the emission impact of combusting the fuel and also the impact of producing the fuel.	Trucks that can run on clean burning fuel can reduce exposure of drivers to diesel fumes. They also have the potential to significantly reduce emissions that contribute to poor local air quality and global warming. Depending on fuel choice, many of these vehicles will have a lower operating cost than diesel fueled trucks. In some cases, financial incentives are available to offset higher up-front costs.

Questions	Opportunities	Potential Benefit
<p>Are the drayage drivers who haul your goods using green driving practices, such as avoiding rapid accelerations and extended idling, as well as driving “slow-and-go” in traffic (instead of “stop-and-go”)?</p>	<p>If no, add “Train and Require Green Driving Practices” to dray bids. Good driving habits can reduce harmful emissions of pollutants in the community; in some cases, automatic idle limitation technology can be installed. Positive incentives, where fuel savings are shared with drivers, can also increase compliance.</p>	<p>Strict anti-idling policies and/or technologies can conserve fuel, reduce noise and avoid costly fines. Aggressive driving habits, like rapid accelerations, can be unsafe and may impose additional wear and tear on tires, engine, and drivetrain.</p>
<p>Is the chassis procurement structure causing inefficiencies for your drayage services? Do your drivers spend unnecessary time and fuel finding an appropriate chassis? Is there a chassis pool or another mechanism available to streamline the chassis provision service?</p>	<p>Helping establish a chassis pooling structure can help simplify chassis provisioning and enable drivers to focus on the cargo rather than the chassis. As a shipper, you can be part of the solution with chassis providers and drayage carriers, especially when considering the complex and dynamic nature of chassis provisioning at ports.</p>	<p>Chassis provisioning can be complex and time-consuming, leading to additional costs and emissions for drayage. Simplifying chassis provisioning will help your drivers make more turns, eliminate unnecessary trips and idling and remove another step in the drayage process that can cause unexpected delays.</p>

DISTRIBUTION CENTERS

KPI: PERCENTAGE OF FACILITIES IN AIR QUALITY HOT SPOTS THAT HAVE AIR POLLUTION MITIGATION PLANS.
The goal is to increase this percentage.

Data Required:
Location of distribution centers
Air quality attainment status of areas where your DCs are located
Percentage of cargo handling equipment at DCs/warehouses using cleaner fuels

Questions	Opportunities	Potential Benefit
For distribution centers and warehouses in locations that have poor air quality, are truck idling restrictions in place?	If no, implement strict no-idling policies on these properties. An idling truck can consume a gallon of fuel an hour.	With the thousands of annual truck trips at large distribution centers, a strict no-idling policy can reduce fuel burn by tens-of-thousands a dollars a year. It will also cut harmful emissions of PM, NOx and other pollutants that harm workers and the surrounding community.
Are you leveraging cleaner fuels at your distribution centers?	If no, consider cleaner fuel options for forklifts, yard hustlers and other mobile equipment. Additionally, determine if on-site renewable electricity generation is possible.	Cleaner fuel options and lower operating costs improve cost certainty. These options can also significantly reduce emissions that contribute to unhealthy occupational exposure for workers, poor local air quality and global warming.
For inbound and outbound moves through air quality non-attainment areas, are off-peak hour deliveries an option?	If yes, explore the viability of off-peak deliveries with key suppliers and customers.	Nighttime deliveries might reduce delivery costs by decreasing the amount of time that is wasted because of heavy traffic. Surrounding communities could also benefit from lower harmful emissions of PM, NOX and other pollutants.

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CHAPTER 4

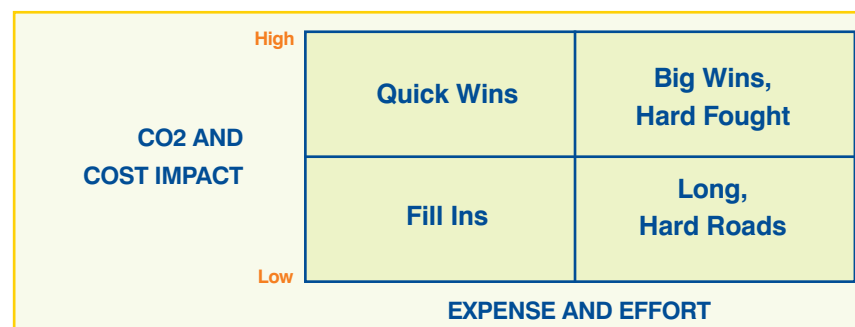
CHOOSE AND IMPLEMENT STRATEGIES

Sustainability initiatives stand the best chance of gaining support when they align with overall business objectives, such as reducing costs and gaining a competitive advantage. Sure, improving the environment and simply “doing the right thing” are good motivators for developing sustainable freight programs, but they’re rarely enough on their own. It’s crucial that environmental efficiency goes hand in hand with fiscal efficiency.

So, where should companies start on freight sustainability? Time and again, the most successful practitioners encourage companies to focus first on where they can get the best return. The good news is that there are a great many initiatives that can achieve both environmental and financial goals quickly and without huge effort.

In the Assess Opportunities section of this handbook, you identified initiatives with strong potential to reduce freight’s impact on your company’s carbon footprint. Now you need to weigh these benefits against the resources needed to make them happen, including capital costs, internal staff and outside consultants.

If you’re just beginning a concerted freight sustainability effort, focus on projects over which you have complete control and can quickly demonstrate results. A simple four-quadrant Action Priority Chart, such as the one pictured here, can help you determine the low-hanging fruit. You’ll want to prioritize projects in the upper left quadrant.



Once you've identified projects that make the most sense, you'll need to do research and crunch some numbers. For each initiative, you'll also want to answer a few questions.

Key questions

What is the predicted greenhouse gas reduction impact?

The specific emissions savings associated with your efforts will depend on the unique circumstances of your company. Many of the strategies included in the Green Freight diagnostic have the end-goal of running fewer trucks miles. Co-loading freight, reducing packaging cube and leveraging software to increase load-factors are all methods to reduce the overall number of truck trips needed to move freight. Several other strategies focused on migrating freight to different modes. Here are some quick rules-of-thumb to determine carbon reductions for these types of changes:

- Eliminating truck miles: 1.6 metric tons of CO2 reduced per 10,000 miles
- Converting truck to rail: 1.4 metric tons of CO2 reduced per 10,000 ton-miles
- Converting plane to ship: 4.5-5 metric tons of CO2 reduced per 10,000 ton-miles

What are the incremental costs involved in implementing the initiative?

This could include additional drayage fees, additional inventory carrying costs, new equipment purchases, and the costs associated with buying, installing and maintaining new software, along with paying for outside consultants, and other expenses. You may need to talk to appropriate contacts in freight operations, warehouse operations, purchasing and other departments to develop cost estimates. You'll also want to determine how you factor in the extra time required by existing staff. Will this time be allocated as a cost of the program, or will you factor in only incremental costs?

To create the most efficient transportation network, software can be a significant expense, but can also deliver a compelling investment return. Tools are available to determine your optimal distribution network, specify lowest mileage routes for truck runs, maximize trailer utilization through smart loading, and determine opportunities for freight consolidation. With Software-As-A-Service (SaaS, or "cloud") models, you don't necessarily need to purchase the software outright. Also, many companies provide outsourced transportation management services and bring with them very sophisticated modelling and optimization tools. One key decision your company will have to make is what IT systems will be required to capitalize on available emissions reduction opportunities, and whether to run them internally or through an outside service provider.

What will be the annual financial savings?

Cost savings will largely be a function of reductions in transportation costs, less any additional inventory carrying costs, recurring capital or financing expenses, or new transportation costs, such as additional dray fees.

What financial metrics should be used for evaluating each potential project?

There are different financial formulas you can use, including Return on Investment (ROI) and Internal Rate of Return (IRR), however the following methods have proven to be the most useful for sustainability projects:

- Net Present Value (NPV) is the sum of forecasted discounted cash flows minus the initial investment, and is the primary measure of a project's attractiveness. Using NPV positions money spent capturing energy/fuel savings opportunities as an investment, not an expense, regardless of whether the project is paid for out of operating budgets or capital investment budgets. In general, projects with a positive NPV should be considered for implementation. There are several variables that influence the calculation of NPV, including discount rate, tax rate and depreciation.
- Simple payback is the length of time required for the accumulated savings of a project (in actual results delivered to the bottom line) to equal the cost (in actual capital) of the initial investment. This metric is frequently used to assess all types of projects. The calculation is simple to understand, and can be convincing when the project payback period is one or two years. Simple payback calculations typically ignore the time-value of money, and cash flows that occur after the payback period, thus underestimating the value of a longer-term investment. Payback calculations should always be accompanied by an NPV calculation to allow for a full assessment of the cost-saving opportunity.

Financial analysis

The following is a hypothetical output from an assessment of potential initiatives to implement. A decision-making tool like this can be great for gaining the company-wide support you'll need. Clearly, the quicker the payback, the more likely it is that you will receive support and approval. However, energy/fuel spend reduction efforts typically take more time, so it's important to be able to lay out a solid financial argument for your investment. In the case below, for example, the project with the largest cost and emissions reduction potential has the longest payback period, but it will deliver the most significant business value in the end.

FINANCIAL ANALYSIS: FREIGHT SUSTAINABILITY INITIATIVES

Initiative	Annual Carbon Reduction	Upfront Cost	Annual Savings	Months for Payback	NPV (10 year)
Leverage software to increase load factor on 4,500 outbound trucks by 5 percent	124 metric tons CO2	\$50,000	\$160,000	4	\$1,073,773
Convert 2,000 truck trips to intermodal	1,800 metric tons CO2	\$2,000,000	\$1,420,000	17	\$7,973,486
Establish a DIY co-loading arrangement for 1,000 annual truck trips	450 metric tons CO2	\$300,000	\$500,000	7	\$3,211,791
Add a distribution center to network to enable significant reduction in outbound miles	6,900 metric tons CO2	\$20,000,000	\$5,700,000	42	\$20,034,415

Driving organizational alignment

To achieve the greatest value, your Green Freight efforts need to have broad buy-in among your executives, supply chain team, and other impacted parties. With this support, this effort can be more than one-time improvement projects.

EDF has worked with hundreds of leading companies to cut energy costs and curb greenhouse gas emissions. We have found that the most successful companies embrace sustainability as part of their culture, as with quality and continuous improvement. The companies that are making the most progress in cutting energy costs and curbing greenhouse gas emissions are benefiting from [The Virtuous Cycle of Strategic Energy Management](#).¹

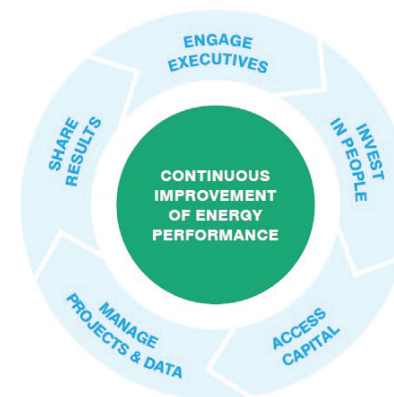
EDF developed this model based on our learnings from EDF Climate Corps – our innovative fellowship program that places specially trained graduate students in companies to save money and reduce emissions by cutting energy waste. Its learnings apply to Green Freight initiatives, too, and may help you to develop an implementation plan.

The five components of the Virtuous Cycle influence one another and work together to influence energy performance. Improving performance in one category provides positive feedback for the entire cycle, while barriers to any individual component can negatively impact the performance of the other components. When all components function at capacity, the virtuous cycle will run smoothly to improve energy performance, generating maximum financial and environmental returns.

1. Executive Engagement The executive leadership team is responsible for setting the organization’s direction, and establishing long term strategy for success. By assigning formal roles and responsibilities for improving organizational energy performance, the leadership team can build accountability and prioritize energy management strategies and goals. The leadership team can then create a comprehensive energy reduction strategy supported by ambitious goals, which will help differentiate the organization as a green leader, and drive innovation through targeted strategies designed to meet those goals.

2. Resource Investment To empower an organization to capture energy savings, its executives need to make strategic, capacity-building investments to free up the necessary human and financial resources that enable concrete action. Making funding consistently accessible allows dedicated personnel to purposefully plan and implement effective energy management. Energy efficiency projects will pay for themselves, but they need dedicated seed capital to get started, as well as attentive managers to ensure those seed funds grow and are reinvested on an on-going basis.

3. People Resources are deployed to build staff capabilities, and to equip them to go after efficiency opportunities. Providing training opportunities, organizing cross-functional teams, and establishing full-time positions for sustainability staff all help to build employee knowledge, foster enthusiasm and create accountability for improvement. A workforce that feels ownership and responsibility for its energy use at all levels – one that is actively encouraged by leadership to work toward a shared vision of optimized energy performance – will maintain the



momentum needed to make real progress and inspire innovative solutions. This organization fosters a culture of collaboration. Staff recognizes the importance examining a challenge from different perspectives. Employees of various levels of seniority are engaged to enable the organization to capture all information and ideas.

4. Projects & Data What gets measured gets managed. Making energy data visible and accessible provides organizations with the information needed to make thoughtful energy-performance improvements. Comprehensive and detailed energy data collection is vital to identifying sources of inefficiency, and gives concrete demonstrations of the energy savings achieved through specific interventions. This, in turn, generates the verified financial and environment results that prove the benefits of taking action in the first place. Ongoing energy-usage tracking validates persistence of savings, and provides feedback to inform future investments.

5. Visibility Sharing results from successful projects helps to maintain momentum beyond a first round of initiatives. Top-level executives appreciate the validation of their plan for prioritizing energy performance as a key strategy. Meanwhile, making results available to the outside world improves corporate transparency and accountability in key performance areas. Success stories tend to make a compelling business case for implementing further energy-saving projects, and they foster a culture of investing in additional human and financial resources to go after even bigger wins.

Implementation guidelines

The following chart includes actions that will help you leverage the Virtuous Cycle model for your Green Freight initiatives.

Action	Benefit	Virtuous Cycle components				
		Executive Engagement	Resource Investment	People	Projects & Data	Visibility
Establish a project lead	This person will be accountable for planning, execution, and evaluation of sustainable freight initiatives, and for maintaining the momentum of the program. This person should have the authority to collaborate across multiple departments to achieve stated goals.			X		
Establish an information manager	This person will ensure the collection and proper dissemination of data related to Green Freight strategies. They will ensure that the needed data management systems are in place and appropriate people have access to the data.			X		

Action	Benefit	Virtuous Cycle components				
		Executive Engagement	Resource Investment	People	Projects & Data	Visibility
Establish a lead for external collaboration	This person will be the lead for identifying and implementing external collaborations with industry partners.	X		X		
Appoint an executive level sponsor	The executive sponsor is responsible for setting the organization's direction and establishing long-term strategies for success. This person is also responsible for the strategic, capacity-building investments necessary to free up the human and financial resources to enable concrete action.	X		X		
Identify an external communications manager	This person will incorporate Green Freight success stories into ongoing corporate communications to stakeholders and the media. If your company already issues a Corporate Social Responsibility report or responds to a Carbon Disclosure Project survey, the point person for those actions likely will be the appropriate person to lead external communications related to Green Freight stories.			X		X
Reward energy-saving in performance evaluations	Staff contributions to sustainability efforts should be considered during performance evaluations. This should apply not only to staff who have specific sustainability responsibilities, but also other staff key to implementing new Green Freight projects.	X		X		
Ensure incentives are aligned for staff	Energy-saving projects can be slowed or even stopped because of internal budget structures. It is important that staff members with the power to implement these projects are not penalized for success. Managers will be less inclined to invest in an energy-saving project if that investment will lead to a smaller budget the following year. One option for aligning incentives is to create a specific budget for energy-saving projects. With access to a specific budget, managers are able to receive incremental capital to put towards efficiency projects and can reinvest the energy savings incurred by those projects.	X	X	X	X	

Action	Benefit	Virtuous Cycle components				
		Executive Engagement	Resource Investment	People	Projects & Data	Visibility
Create a central project database	Create momentum and spur innovation by listing, in one place, all energy-saving projects underway. Include data on performance, costs and details about successes and challenges. Provide staff with access to this information. Encourage staff to review project write-ups and suggest opportunities to apply project learnings to other initiatives. This is particularly important for sharing information at companies with distinct regional operations or distinct business units.				X	X
Develop plan for sharing success stories internally	Sharing successful results maintains momentum beyond a first round of initiatives. Ongoing engagement of top-level executives validates their prioritization of energy performance as a key strategy. Success stories make the business case for implementing additional energy projects and encourage the investment of additional human and financial resources to go after even bigger wins. Engaging employees on specific topics, such as recycling or energy efficiency, can lead to them feeling empowered and more engaged in their work as a whole.				X	X
Broaden the staff engaged in Green Freight efforts	Establish a process for encouraging suggestions on new energy-saving projects. Provide training opportunities and organize cross-functional teams to build employee knowledge, foster enthusiasm, and create accountability for improvement. A workforce that feels ownership and responsibility for its energy use at all levels, and is actively encouraged by leadership to work toward a shared vision of optimized energy performance will maintain the momentum needed to make real progress and inspire innovation.	x	X	X	X	X
Add Green Freight metrics to standard internal reporting	Performance metrics on freight sustainability, such as total miles, fuel usage and carbon emissions, should be part of the team's ongoing performance reporting, alongside on-time delivery, safety and other critical success factors.			X	X	
Develop a Green Freight scorecard	Your scorecard will be a uniform way of evaluating energy-saving projects. It will enable identification of top-performing projects, while also revealing learning opportunities. The data collected here can also be useful in CSR reports and other venues for demonstrating corporate leadership on sustainability.				X	

Action	Benefit	Virtuous Cycle components				
		Executive Engagement	Resource Investment	People	Projects & Data	Visibility
Create a Green Freight data management plan	Making energy data visible and accessible provides organizations with the information needed to make thoughtful energy performance improvements. Comprehensive and detailed data collection is vital to identifying sources of inefficiency, and measuring the energy savings achieved through specific interventions. This data generates the verified financial and environmental results that prove the benefits of taking action in the first place. Investments in data management software will be necessary for some companies. This investment will enable regular reporting of key Green Freight metrics, such as emissions per ton-mile and fuel usage. It will also inform future projects.		X		X	
Establish and communicate a public goal	Public goals enable companies to fully leverage the Virtuous Cycle. These goals provide a platform for executive engagement, including reporting on progress and challenges. Goals encourage longer-term thinking, leading to increasing buy-in for more impactful projects that also require up-front investments. Public goals are statements of commitment to internal and external stakeholders.	X		X	X	X

TIPS FROM THE EXPERTS

CHOOSING AND IMPLEMENTING SUSTAINABLE FREIGHT STRATEGIES

- Ensure support from top executives. Without this support, it will be difficult to implement or sustain Green Freight initiatives.
- Choose initiatives that align with the company's stated environmental and energy goals. Continually reinforce how specific Green Freight efforts contribute to these broader goals.
- Think big, but start small and simple. Get early wins under your belt. Start with a project that is easily measured; one where you can see a clear start and finish.
- Identify key staff members with the power to make required changes. Clarify what resources you have at your disposal. Manage expectations regarding what you expect from staff in terms of time and availability.
- Establish a measurable goal that is time-based. Make your goals visible inside and outside the company. Knowing that others are watching and monitoring progress against the goal is a motivator, since people want to succeed. People also want to be part of something important.
- Communicate to business partners, carriers and 3PLs. Let them know of your sustainability goals and plans. Solicit their ideas and involvement.
- Establish a timeline. Revisit and report progress regularly.

For more information: www.edf.org/freight

Notes

1. Hiller, Jake; Reyna, Emily; Riso Chris, Environmental Defense Fund; and Jay, Jason, MIT Sloan School of Management, The Virtuous Cycle of Organizational Energy Efficiency: A Fresh Approach to Dismantling Barriers, 2012.

CHAPTER 5

SET GOALS AND REPORT RESULTS

Global leaders in freight sustainability share common traits. Their programs are performance-based. They establish objectives – both broad-based and specific to individual initiatives – and regularly report these freight sustainability metrics. Within their organizations, they have established a culture in which sustainable freight operations are viewed as a long-term commitment, not a one-time event.

In many cases, these companies have also made aggressive public commitments to reduce freight-related greenhouse gas emissions. Here are a few examples:

UNILEVER	“By 2020, CO2 emissions from our global logistics network will be at or below 2010 levels despite significantly higher volumes. This will represent a 40 percent improvement in CO2 efficiency. Unilever plans to achieve this by reducing truck mileage, using lower emission vehicles, employing alternative transport, such as rail or ship, and improving the energy efficiency of warehouses.” ¹
DELL	“By 2020, Dell will reduce greenhouse gas emissions by 50 percent from its facilities and logistics operations.” ²
IKEA	“Ikea’s goal is to reduce CO2 emissions per cubic meter of products transported by 20 percent by the end of FY16, from FY11 levels.” ³

General commitments to reduce greenhouse emissions from freight typically yield poorer results than the specific goals cited above. The illustrated “SMART” approach to goal setting can be a good guide. Because Green Freight strategies have been largely untapped by many shippers, dramatic improvements are possible. When it comes to setting goals for freight sustainability, don’t underestimate your power to change things. Set aggressive targets and challenge the organization to achieve them. Setting a modest goal may allow you to declare victory when it is achieved, but can leave you far short of your emissions reduction potential.

There are two types of sustainability goals. **Absolute goals** involve increasing or decreasing a specific baseline number. For example, “Reduce freight-related carbon emissions by x%.” **Normalized goals** frame progress relative to another factor – for example, “carbon emissions per ton of product” or “carbon emissions per sales dollar.” Achievement toward normalized goals is particularly useful when demonstrating trends in performance and benchmarking your results against a peer group.



Reporting results

Sustainability metrics have become a standard component in annual corporate social responsibility (CSR) reports. Key stakeholders, including shareholders, customers, employees, and community groups, want to know about the successes and challenges your company is facing in the area of sustainability. Freight and logistics operations can have a substantial positive impact on sustainability goals for large and mid-size companies. Given the strong correlation between transportation cost reductions and improvements in sustainability performance, freight logistics teams can contribute “good news” stories that can be shared in CSR reports and other public communications.

Who does the reporting?

The corporate department responsible for sustainability (typically the Environmental Health & Safety or CSR group) typically gathers data from across the organization and reports on sustainability practices and results. Your logistics and transportation team should work closely with your sustainability officer to communicate the strategies employed and the specific results achieved through Green Freight initiatives. To facilitate the process and minimize extra data gathering, integrate sustainability metrics into your department’s standard performance reports.

What should you report?

A sustainability report is more than a spreadsheet with data. It should be a compelling story that outlines your organization’s journey toward becoming a better corporate citizen. In addition to listing your goals and progress, describe your department’s new projects, like switching to intermodal or redesigning your distribution network. What key learnings have you taken from the process? If you’re not on track to achieve a goal, describe the challenges you’ve faced, and what infrastructure or other external barriers are limiting your progress.

Below are links to recent reports that provided data and context about each company's progress and challenges along its Green Freight journey.

Scotts Miracle-Gro: 2011 Corporate Responsibility Report The company notes the share of its CO2 emissions that are associated with distribution operations (38 percent), reports on one pilot effort to improve its performance, and highlights future plans to scale-up the pilot project.

[Read the report](#)

Heinz: 2013 Corporate Responsibility Report The company states that the transportation network is within the bounds of its global sustainability goal (10 percent reduction in fossil fuel consumption and GHG emissions per unit of production), reviews its main strategies for tackling transportation emissions, and acknowledges challenges in meeting its stretch target.

[Read the report](#)

JC Penney: 2013 Sustainability Report This report includes an engaging diagram that describes fuel-savings strategies used in four legs of product logistics: manufacturing to DCs; DCs to stores; reverse logistics; and e-commerce deliveries. The company reviews how it is helping to reduce harmful air pollutants in and around the ports of Los Angeles and Long Beach.

[Read the report](#)

[For more information: www.edf.org/freight](http://www.edf.org/freight)

Notes

1. [Unilever Sustainable Living Commitment](#), 2013.
2. [Dell Press release](#) October 15, 2013.
3. [IKEA Sustainability Report](#), 2012.

CHAPTER 6

CONCLUSION

Right now, you have an exciting opportunity to create business value and improve environmental performance by implementing Green Freight strategies. Whether you're a retailer, manufacturer, or supplier, you can contribute to a greener planet and save money by getting smarter about how you manage your freight operations. Freight transportation typically accounts for 15 percent of the cost of goods sold. It also accounts for percent of U.S.-based corporate emissions. When moving goods, costs and carbon are highly correlated metrics – improve one and you will likely improve the other, too.

Through the EDF Green Freight Handbook, we have provided you with the key tools you need to advance your green freight journey.

ESTABLISH METRICS Define the objectives of your green freight efforts and track your progress through performance-based metrics, such as greenhouse gas emissions per ton-mile. Well-defined metrics will keep you focused on the projects with the biggest impact.

ASSESS OPPORTUNITIES Leverage the EDF Five Principles for Greener Freight to identify impactful, strategic green freight projects that create business value and improve environmental performance.

CHOOSE AND IMPLEMENT STRATEGIES Scale-up green freight activities at your company. Use key financial metrics and internal strategies to build the capacity and support needed for these efforts to thrive.

SET GOALS AND REPORT RESULTS Communicate your green freight efforts to key stakeholders and set challenging, multi-year environmental performance goals.

By utilizing these tools you can unlock the environmental, economic and fuel-security benefits available through more efficient logistics.

Whether your company is researching green freight efforts for the first time or has set a multi-year improvement goal, EDF encourages you to take the next step. By acting today, the influential community of freight shippers can help create a future where freight transport remains affordable, results in less greenhouse gas pollution, and minimizes the threat to public health.

CHAPTER 7

EDF'S WORK ON FREIGHT

EDF Green Freight Initiative

EDF's Green Freight initiative partners with leading retailers, manufacturers, consumer brands, and other large freight shippers to achieve transformational reductions in greenhouse gas emissions and fossil fuel consumption from supply chain logistics. EDF works with companies to establish metrics to track progress; implement cost- and carbon-saving strategies, and set measurable targets for sustainability in logistics operations. Through our thought-leadership and case studies, we share our learning so other companies can benefit too from cost-effective and carbon-efficient green freight practices.

EDF Clean Ports Project

EDF works to protect the health of communities that live near marine ports by reducing harmful air emissions and climate risk at these facilities. To accomplish this, we collaborate with key stakeholders, including beneficial cargo owners, port authorities, logistics service providers, community groups, the U.S. Environmental Protection Agency and other government agencies. We seek a comprehensive strategy to address emissions from port operations and are creating an index of environmental best management practices being employed at ports. The index will highlight top performing ports. It will also showcase "gold standard" operational efficiencies and the role of advanced, cleaner technologies.

Work with the EDF Green Freight Team

There are many ways EDF can support your company's efforts to create a more efficient, sustainable supply chain.

Explore the EDF website.

The Green Freight section features helpful Green Freight data, strategies, case studies and publications.

Request a Phone briefing.

This hour-long briefing links you with EDF experts to discuss best practices in sustainable logistics.

Contact EDF's Green Freight team

EDF Experts

Hire an EDF Climate Corps Fellow.

Each summer, trained fellows from the nation's top graduate programs team up with leading organizations to identify and implement high-value energy management strategies.

Host an EDF Green Freight workshop.

This half-day, in-person discussion focuses on how your company can apply industry best practices to logistics operations.

Establish a Green Freight Emissions Improvement Goal.

Our customized Green Freight goal-setting engagement combines phone calls and on-site workshops to help you create your own goal and plan of action.

Email: greenfreight@edf.org

Phone: 617 406 1806

Web: www.edf.org/freight

Elena Craft, Ph.D., Senior Health Scientist

Dr. Craft's background is in molecular toxicology; she holds a M.S. degree in toxicology from NC State University, and a Ph.D. from Duke University. She also holds an adjunct assistant professorship at the University of Texas School of Public Health in the Division of Epidemiology, Human Genetics, & Environmental Sciences. Her research experience includes work at both the U.S. EPA and the National Institute of Environmental Health Sciences, where she studied the health effects resulting from exposure to environmental pollutants such as PCBs, dioxins, and metals. Over the last seven years, she has worked to identify, monitor, and mitigate risk from environmental pollution in highly industrial areas, most specifically around port areas, petrochemical facilities, natural gas drilling areas, and freight corridors.

Jason Mathers, Senior Manager Supply Chain Logistics

Jason leads the EDF Green Freight initiative. He works with some of the world's largest companies to improve the bottom line and cut fuel consumption associated with freight movement. The companies he works with include Caterpillar, Walmart and Ocean Spray. In 2013, Jason was named a "Pro to Know" by Supply & Demand Chain Executive Magazine - a prestigious recognition and an acknowledgment of his ability to work with industry to affect change. Jason has managed EDF light- and medium-duty fleet partnerships, working with PHH Arval, Pepsi, FedEx, and Abbott Labs among others. Prior to joining EDF, Jason was an organizer with the Union of Concerned Scientists. Jason has a graduate degree in economics from Suffolk University. He is also a veteran of the U.S. Navy.

Marcelo Norsworthy, Transportation Analyst

Marcelo works on air pollution issues related to freight logistics and transportation. He has developed and analyzed metrics for estimating emissions at ports, worked with corporate partners on leveraging their support for pollution mitigation programs, conducted an evaluation of clean truck programs, and partnered with the U.S. EPA and other federal and regional agencies on transportation sustainability. Marcelo focuses on criteria pollutant emissions and their localized health effects, especially how they affect environmental justice communities, trade shifts and growth associated with the Panama Canal expansion, expanding outreach to Latin American partners and measurement of seaport environmental programs.

Christina Wolfe, Ports & Transportation Analyst

Chris has more than ten years of experience in various scientific roles that include air quality, environmental studies and toxicological assessment, in addition to six years of experience in business analysis and finance. At EDF, she works on ports and transportation projects for the US Climate and Energy team and is currently managing an executive level port stakeholder group to develop recommendations for establishing environmental performance metrics at ports. She also works to identify potential innovative partnerships to leverage grant funds for environmental projects. Her technical expertise is in air quality regulation (mobile and stationary sources) and the development of scientific and financial models. Chris holds a master's degree in Biology from the State University of New York at Stony Brook, as well as bachelor's degrees in both Biology and Business Administration from the University of Washington.