How to Calculate and Manage CO_2 Emissions from Ocean Transport

A Clean Cargo Working Group (CCWG) Guide

February 2015

About CCWG
The Clean Cargo Working Group (CCWG) is a global, business-to-business initiative dedicated to improving the environmental performance of marine container transport. CCWG creates practical tools for measuring, evaluating, and reporting the environmental impacts of global goods transportation.

About this Guide
Companies seeking to measure and reduce their supply chain emissions face a complex task in gathering comparable data and verifying its quality. The CCWG methods were developed to balance technical accuracy with practical application. The current CO_2 emissions methods have been in use for five years.

Introduction

CCWG has developed tools and methods to calculate the CO_2 footprint for a single shipment or a total transportation company, and to assess supplier environmental performance.

Transportation procurement managers use these tools as a factor in supplier selection, and to quantify and drive improvements for this important category in corporate greenhouse gas (GHG) reduction targets. Specifically, they can:

- » Calculate a CO_2 footprint
- » Assess supplier environmental performance
- » Select suppliers using sustainability criteria

In this CCWG guide, we provide explanation of each of these approaches to calculate and manage CO_2 emissions from ocean container transport.

Calculate a CO_2 Footprint

Each year CCWG conducts an environmental performance study and publishes the industry average CO_2 emissions factors for 25 major trade lanes based on operating data from all CCWG carriers.[1] These can be used to calculate the transportation CO_2 footprint and to track and report improvements over time.

To perform a single shipment or route comparison:
1. Look up the CCWG CO_2 emissions factor for the trade lane (carrier-specific or industry average).
2. Determine the distance traveled between port of origin and port of destination using Dataloy or other nautical distance resources.
3. Multiply the CO_2 emission factor with the distance between the ports and the number of containers for that shipment.

To calculate a company's CO_2 footprint from ocean container transport:
1. Identify the trade lanes and port pairs used.

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[1] 2014 report available at: http://www.bsr.org/en/our-insights/report-view/global-maritime-trade-lane-emissions-factors

2. Determine the number of containers shipped between each port pair on each trade lane.
3. Look up the CCWG CO_2 emissions factor for each trade lane and the distance travelled between each pair of ports.
4. Multiply the CO_2 emission factor times the number of containers for that port pair times the distance between the ports.
5. Add up the CO_2 emissions for all the trade lanes of interest.

More detail on determining distance will be available in the "CCWG CO_2 Methodology Report," to be published in early 2015. For companies that only need carbon footprint information for ocean transportation, the process is complete. Calculations can be extended to cover all modes of transportation using the Intermodal Calculator available to CCWG members and other tools.

Table 1: Example of a CO_2 footprint calculation

Trade lanes & port combinations	Number of containers (TEU)	Distance travelled (km)	Emission factors (gCO₂/TEU-km)	CO₂ emissions (metric tons)
Asia – North Europe				
Shanghai – Rotterdam	150	20,000	47	141
Hong Kong – Bremerhaven	30	18,500	47	26
Asia – US West Coast				
Hong Kong – Long Beach	70	12,000	59	50
Europe – Africa				
Rotterdam – Lagos	40	8,000	77	25
Total company CO₂ emissions[2]				**242**

Assess Supplier Environmental Performance
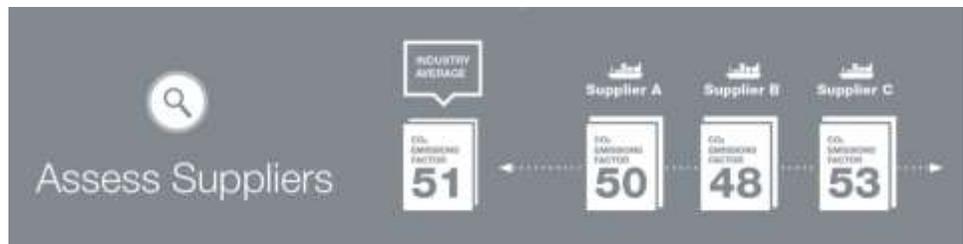
Buyers of container shipping services regularly evaluate their suppliers on price, on-time delivery, and customer service. CO_2 emissions and other sustainability criteria can also be used in this process.

The CCWG Scorecard data for each carrier include carrier-specific CO_2 emissions factors for each of the 25 trade lanes as well as a number of other sustainability factors. CCWG members also receive an annual benchmarking comparison tool showing the performance of all participating carriers.

These data can be used to assess a container-shipping company's performance on specific trade lanes, track year-over-year improvements, and set goals for

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[2] Note that the calculation includes a conversion from grams to tonnes. 1,000,000 grams = 1 metric tonne.

future improvements.

Table 2: Example of a supplier assessment – Ocean Carrier A

SUPPLIER CO_2 ASSESSMENT: CONTAINER SHIPPING			
Trade lane	**CO_2 emissions factor** (CO$_2$ g / TEU-km)		
	2012	2013	% improvement
Asia – N. Europe	52	50	3.8%
Asia – N. America East Coast	75	78	(4.0%)
Europe – Latin America	65	66	(1.5%)

Companies also use CCWG tools and methods to compare suppliers, encourage wider improvements in the container shipping industry, and reward better-performing suppliers. The CCWG trade lane emissions factors provide the industry average, and the CCWG Scorecard enables peer-to-peer comparisons.

Table 3: Example of a comparison of carrier CO_2 factors

SUPPLIER GHG BENCHMARKING: CONTAINER SHIPPING				
Trade lane	**CO_2 emissions factors** (CO$_2$ g / TEU-km)			
	Carrier A	Carrier B	Carrier C	*CCWG Industry average*
Asia – N. Europe	50	48	53	*51*
Asia – N. America East Coast	78	75	81	*79*
Europe – Latin America	66	80	73	*75*

Some companies use carrier CO_2 comparisons solely for internal purposes, or use rankings in carrier dialogues and performance appraisals. Companies also use these data to define "good" performance. One approach is a scorecard that allocates points for CO_2 performance compared to the trade lane averages. Shippers may also recognize verified data with higher points, as shown below.

Table 4: Example of CO_2-based scoring

Performance	Points for carriers with <u>verified</u> CO_2 data	Points for carriers with <u>non-verified</u> CO_2 data
25% better than CCWG average	100	10
10% better than CCWG average	50	10
5% better than CCWG average	25	10
At CCWG trade lane average	15	10
Below average	5	0

Once scoring criteria are established, companies can calculate and compare scores for each supplier. In this example, Carrier A had the best overall performance. Note that while Carrier B reported better performance than Carriers A and C, the points awarded to Supplier 2 reflect that the data were not verified.

Table 5: Example of CO_2-based supplier scoring

	Trade lane 1	Trade lane 2	Trade lane 3	Aggregated score	% of Total (300)
Carrier A	100	50	50	200	66%
Carrier B (*)	10	10	10	30	10%
Carrier C	100	0	0	100	33%

*based on non-verified data

Select Suppliers Using Sustainability Criteria

Based on this information, some companies may choose to take the final step toward CO_2 improvements in their ocean transportation supply chains by integrating CO_2 performance data as part of their supplier selection processes.

Doing this effectively, however, is a challenge that most companies have yet to perfect. Companies are starting to experiment with ways that CO_2 and other sustainability data can factor into the procurement decision, not *in place of*, but *alongside* conventional value attributes such as quality, service, and delivery.

Table 6: Example of procurement integration

Parameters	Weighting	Carrier A	Carrier B	Carrier C
Costs	50% max 50 points	30	40	15
On-time delivery	40% max 40 points	37	25	40
CO_2 performance	10% max 10 points	6.6 (66% of 10)[3]	1 (10% of 10)	3.3 (33% of 10)
Total	100	72.6	66	58.3

In this example, which was inspired by the procurement practices of a CCWG member, the company has allocated a weight of 10 percent to CO_2 performance, indicating that carrier A has the best performance overall.

For More Information

CCWG currently includes more than 85 percent of the global ocean container capacity. Each year, carrier members provide actual operational data on each of their vessels for a global environmental study.[4] One output of this annual study is the CCWG Trade Lane Emissions Factors report referenced above.

If you are interested in joining our work and benefiting from CCWG's ready-made tools and data, we encourage you to contact BSR, the CCWG secretariat, at ccwg@bsr.org. Other resources related to membership, CCWG members, and CO_2 calculations can be found at:

» CCWG Home Page

» Report: How shippers use, integrate, and benefit from ocean emissions data

» Report: Collaborative Progress CCWG Progress Report 2013

> **Shipper Perspective: Nike**
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> *"The Clean Cargo Working Group data enable Nike to get an aggregate view of what the industry is doing as well as the detailed data of each of its business partners. Nike appreciates CCWG data because they are objective, measureable, and provide data on ocean carriers year over year. CCWG's environmental data help Nike to make better and more informed decisions in its sustainability performance reporting and procurement process."*
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> *— Dawn Vance, Nike (Retired).*