

# Sustainable Supply Chain Logistics Guide



Created for Metro Vancouver by Meyers Norris Penny and subsequently modified by Fraser Basin Council - BuySmart Network. The Guide was designed by TMT Communications. Special thanks to Metro Vancouver for their guidance in the development of this Guide. Thanks also go to the following individuals who contributed information to the best practice examples found in this guide and/or tested the online self-assessment tool:

**Azure Dynamics:** Tom Dielschneider

**Canadian Autoparts Toyota (CAPTIN):** Bob McKenzie, Ashley Meek

**Canadian Springs:** Mengo McCall, Rob Prosser

**Catalyst Paper:** John Lindsay, Gerry Rolufs, Wayne Friesen, Larry Ritchie

**ContainerWorld:** Dan Miles

**General Hydrogen:** Edward Li

**London Drugs:** Brian Best, Bob Howe, Ken Jensen, Brian Devereaux

**Motion Canada:** Tom Dielschneider

**Nature's Path:** Dag Falck, Jyoti Stephens, Greg Nault

**Purolator:** Serge Viola

**Sustainability Ventures:** David Van Seters

**TDL Group (Tim Hortons):** Tom Keigher

**UNFI Canada:** Alberto Lara

**Versacold:** Wendell Marshall, Barry Tiller

© Copyright 2011 Greater Vancouver Regional District

#### Disclaimer

Copyright to this publication is owned by the Greater Vancouver Regional District ("Metro Vancouver"). Permission is granted to produce or reproduce this publication, or any substantial part of it, for personal, non-commercial, educational and informational purposes only, provided that the publication is not modified or altered and provided that this copyright notice and disclaimer is included in any such production or reproduction. Otherwise, no part of this publication may be reproduced except in accordance with the provisions of the Copyright Act, as amended or replaced from time to time.

While the information in this publication is believed to be accurate, this publication and all of the information contained in it are provided "as is" without warranty of any kind, whether express or implied. All implied warranties, including, without limitation, implied warranties of merchantability and fitness for a particular purpose, are expressly disclaimed by Metro Vancouver.

The material provided in this publication is intended for educational and informational purposes only. This publication is not intended to endorse or recommend any particular product, material or service provider nor is it intended as a substitute for engineering, legal or other professional advice. Such advice should be sought from qualified professionals.



Visit [www.metrovancouver.org](http://www.metrovancouver.org) and search for SmartSteps

---

## TABLE OF CONTENTS

Introduction	1
About This Guide	1
Intended Audience	2
Organization of the Guide	2
1. Sustainable Supply Chain Logistics: Good Business Sense	3
What is Supply Chain Logistics (SCL)?	4
What is Sustainable SCL?	5
Business Trends and Implications for Sustainable SCL	6
2. Sustainable SCL Results in Financial, Environmental and Social Benefits	7
Types of Benefits Available from Sustainable SCL	8
Measuring the Benefits	10
3. Assess Your Performance	11
4. Best Practices in Sustainable SCL: PLAN	16
5. Best Practices in Sustainable SCL: STORE	20
6. Best Practices in Sustainable SCL: TRANSPORT	26
7. Best Practices in Sustainable SCL: REVERSE LOGISTICS	32
8. Suggested Actions to Get Started on Sustainable SCL	35
Critical Success Factors for Implementing Sustainable SCL	37
Tips for Achieving the Critical Success Factors	37
9. Measuring Success and Continuous Improvement	44
Key Performance Indicators - Tips and Templates	45
10. Additional Resources	49



## INTRODUCTION

### ABOUT THIS GUIDE

This Guide is about sustainable supply chain logistics (SCL)—that is, the planning, storage, transportation and reverse logistics processes involved in getting goods and services to the right place, at the right time and in the right condition, while minimizing the impacts on our natural and social environments.

The information in this Guide will help businesses to implement SCL strategies that lead to financial *and* environmental and social benefits. The Guide provides:

- Workable ideas for improving logistics efficiency and effectiveness while also reducing the fuel or energy consumed, emissions produced, or waste that results from logistics activities.
- Experiences of companies that have implemented and benefited from sustainable SCL practices.
- A self-assessment checklist that will help companies identify target areas for improvement.
- Suggested actions and helpful resources to get started on making sustainable logistics improvements, large or small.

---

## INTENDED AUDIENCE

The primary audience of this Guide includes manufacturers, wholesale or retail distributors and logistics companies—all of which have logistics-intensive operations. Service-based companies and institutions such as education, healthcare and government should also find relevant and helpful information in the Guide.

This Guide will benefit those overseeing internal functions such as environment, health and safety; sustainability/corporate social responsibility; warehouse operations; fleet operations; purchasing and external/ regulatory affairs; product and operations design; and reverse logistics.

Learning objectives of this Guide are to raise your awareness and understanding of: i) what Sustainable SCL is and the business case for its implementation; ii) sustainable SCL best practices and case examples; and iii) specific opportunities for your organization to make improvements, based on your self-assessment.

## ORGANIZATION OF THE GUIDE

The Guide is organized into ten sections:

**Section 1** introduces sustainable supply chain logistics (SCL) and discusses how sustainable SCL practices can help you address the environmental and social impacts of your company's SCL activities while still meeting your financial objectives.

**Section 2** presents the benefits of sustainable SCL.

**Sections 3** provides an assessment tool you can use to rate your company's performance for each best practice; completing this assessment will give you insights about where your company might achieve sustainable SCL benefits. This section is useful for a broad range of organizations.

**Section 4 to 7** describe best practices in four sustainable SCL functions—namely plan, store, transport and reverse logistics—and feature examples of practices implemented by companies and the benefits they have achieved. These sections are particularly relevant to manufacturers and warehouse/distribution companies.

**Section 8** outlines critical success factors for achieving sustainable SCL improvements and recommends actions to get started.

**Section 9** provides a list of resources where you can learn more about sustainable SCL.

**Section 10** provides suggestions on how to measure and continuously improve your sustainable SCL performance.



## 1 SUSTAINABLE SUPPLY CHAIN LOGISTICS: GOOD BUSINESS SENSE

Supply chain logistics (SCL) activities are integral to the effective and efficient movement and storage of goods between the points of origin and destination or back again. As the home of Canada's largest port and the Vancouver International Airport, with its strategic location on the Highway 99/I-5 trade corridor, Metro Vancouver is a growing transportation hub and trans-shipment point.<sup>1</sup>

While SCL activities are critical to this region's success, freight storage and transportation impact ecosystems and communities, consume non-renewable resources and generate harmful air and water emissions. While it is commonly assumed that activities of the warehousing/transportation sector and the environment are at odds, sustainable SCL practices can, in fact, provide solutions that benefit our natural and social environments without hurting the financial bottom line.

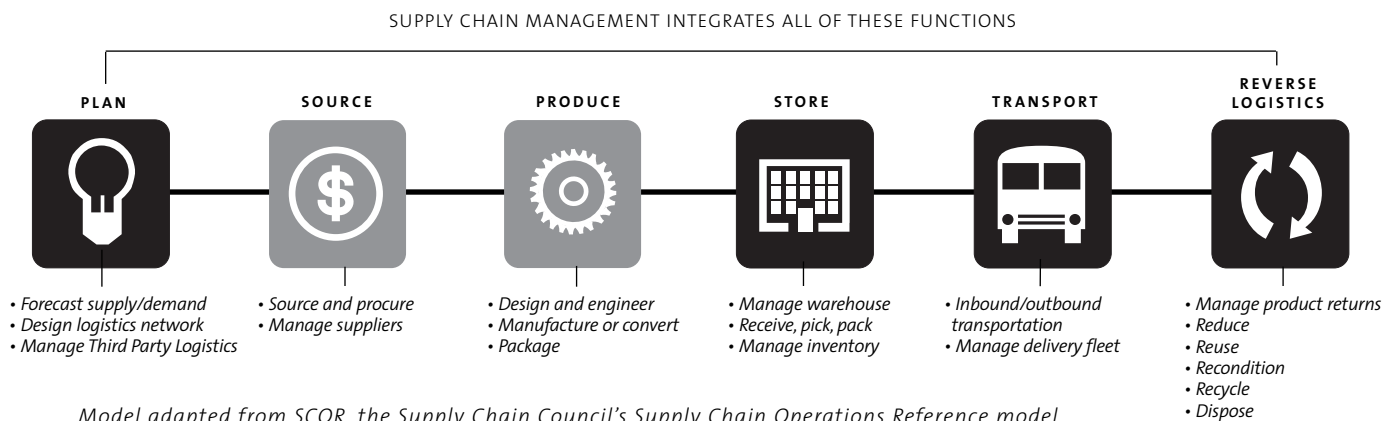
## WHAT IS SUPPLY CHAIN LOGISTICS (SCL)?

Supply chain logistics (SCL) is better understood within the context of end-to-end supply chain management, depicted in figure 1.

End-to-end supply chain management emphasizes communication, collaboration and coordination between a company's supply chain functions and those of its suppliers, customers and service providers. A high-performing supply chain results in increased revenue, reduced costs and waste, improved asset utilization and enhanced customer service.

SCL functions—the darker-shaded areas labelled plan, store, transport and reverse logistics—are integral to a high-performing supply chain.

**Figure 1 – Supply Chain Logistics Functions within an End-to-End Supply Chain**



The best practices outlined in this Guide apply to inbound and outbound SCL, since one company's outbound supply chain is another company's inbound supply chain. Even where companies do not control decisions about their inbound supply chain, they can influence their suppliers' choices of modes, transportation load factors, the use and reduction of reusable packaging or shipping containers and so on.

Although not within scope of this Guide, purchasing and production are also shown in figure 1 as essential parts of the supply chain; in fact, they warrant separate guides to explore the issues appropriately. See the resource list in the sidebar to access Metro Vancouver and other resources about sustainable purchasing and production.



### MORE RESOURCES

The Metro Vancouver SmartSteps™ series of publications, available at [www.metrovancouver.org/smart-steps/bestpractices/Pages/SectorGuides.aspx](http://www.metrovancouver.org/smart-steps/bestpractices/Pages/SectorGuides.aspx) include the *Sustainable Purchasing Guide* as well as sector guides such as *Manufacturing*, *Transportation* and *Warehousing*. These publications provide useful ideas and advice for implementing sustainable business purchasing and production practices.

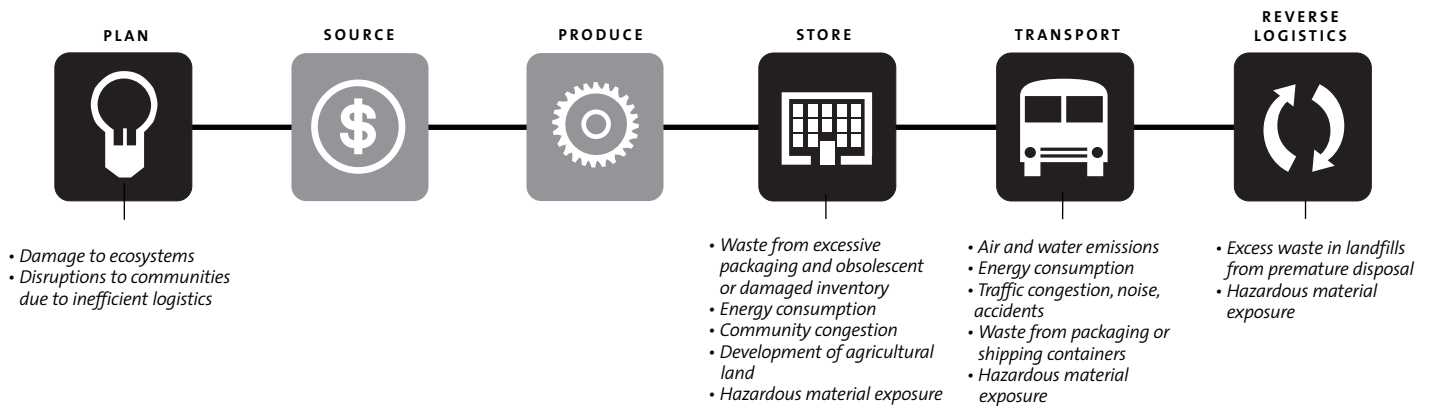
The National Research Council's *Design for Environment* guide covers design for logistics issues. For a copy of this guide contact: [Public-inquiries.IRAP@nrc-cnrc.gc.ca](mailto:Public-inquiries.IRAP@nrc-cnrc.gc.ca). Other resources include the Fraser Basin Council ([www.fraserbasin.bc.ca](http://www.fraserbasin.bc.ca)) and its E3 Fleet rating program ([www.e3fleet.com](http://www.e3fleet.com)) and sustainable purchasing network ([www.buysmartbc.com](http://www.buysmartbc.com)), as well as Supply Chain & Logistics Canada ([www.supplychaincanada.com](http://www.supplychaincanada.com)) and the Canadian Material Handling & Distribution Society ([www.cmhds.org](http://www.cmhds.org))

### WHAT IS SUSTAINABLE SCL?

Sustainable SCL explicitly manages the environmental and social impacts of SCL activities; that is, the effective and efficient movement and storage of goods between the points of origin and destination or back again.<sup>2</sup>

Typical environmental and social impacts of SCL activities are shown in figure 2.

**Figure 2 – Environmental and Social Impacts of SCL Activities**



*Model adapted from SCOR, the Supply Chain Council's Supply Chain Operations Reference model*

#### DID YOU KNOW

Freight movement contributed 21% of the growth in greenhouse gas (GHG) emissions between 1990 and 2003, almost entirely due to emissions from trucking.

Sustainable Transportation Monitor, No. 11, June 2005, The Centre for Sustainable Transportation, [www.richardgilbert.ca/Files/2005/STM11%20\(Web\).pdf](http://www.richardgilbert.ca/Files/2005/STM11%20(Web).pdf)

Beyond these environmental and social impacts, the financial implications for businesses of congested transportation infrastructure, high fuel and energy costs and logistics-related health and safety incidents are significant.

Over 360 million tonnes of cargo moves to, from, or within BC annually and the amount is increasing. Truck movements alone are expected to increase from 16,000 peak-hour movements today, to over 21,000 by 2013.<sup>3</sup> Since most of these movements take place in the Greater Vancouver region, the financial, environmental and social impacts of SCL activities will increase in the region if they are not managed.

The answer to reducing these impacts is not to constrain SCL activities, but to manage them proactively through sustainable SCL practices.

## BUSINESS TRENDS AND IMPLICATIONS FOR SUSTAINABLE SCL

Lowering costs through increased efficiencies and standing out from your competition are just two reasons to pursue sustainable SCL. Others include the need to address more stringent regulatory requirements, meet growing customer demands for environmentally-responsible alternatives, and respond to increasing expectations of employees that the organization they work for takes corporate responsibility seriously. The following are some examples:

### BUSINESS TREND

Increasingly, corporate purchasers are adopting **sustainable purchasing policies** and asking suppliers to demonstrate compliance with environmental, health and safety, human rights and labour standards.

### IMPLICATIONS FOR SUSTAINABLE SCL

To win and retain customers today, manufacturers and service providers increasingly have to address the environmental and social performance of their business activities, including SCL.

**The evolving role of third party logistics companies (3PLs)**, from warehouse and transportation providers to strategic supply chain partners, increases the strategic importance of managing the financial, environmental and social performance of SCL activities to avoid damage to brand reputations.

Ensuring alignment (or spotting the lack thereof) between a 3PL's business practices and a shipper's sustainability objectives is critical. 3PLs will face increasing customer demands to improve sustainability performance.

**Corporate social responsibility statements** are increasingly prevalent.

To deliver on corporate commitments, SCL functions will be expected to enhance—not undermine—stated corporate responsibility positions.

### **Government regulations and incentives at the product, facility and transport levels.**

For example, Canada's obligations to lower greenhouse gas (GHG) emissions under the Kyoto protocol are leading to new regulations and government incentives.

SCL efficiencies can contribute to reducing GHG emissions. New government programs offer incentives for capital improvements that lower emissions and improve energy efficiency.

**Just-in-time manufacturing and direct-to-consumer business models** such as online shopping are resulting in more time-sensitive, smaller and more frequent package shipments.

Increasing order fulfillment costs are driving companies towards lighter weight and more efficient packaging and transportation methods.

Local governments are adopting **extended producer responsibility policies** and regulations to transfer responsibility for and costs of waste from taxpayers to producers.

To comply with voluntary and/or mandatory programs, producers need to design products and packaging and implement reverse logistics practices that enable efficient, safe and cost-effective recovery and disposition of products and packaging at the end of their useful lives.

**Diminishing supply and increasing costs of fossil fuels.** Prices are predicted to rise steeply and demand is growing for government policies aimed at reducing fossil fuel use before the peak in production occurs.

The freight transportation industry will be significantly affected by higher fuel prices and policies that discourage the use of fossil fuels.

## DID YOU KNOW

“Supply chains must respond to environmental pressures from four sources. Resource availability and regulatory pressures place physical, legal and economic constraints on supply chain management, while consumer demands and the ethical responsibilities of corporations define desirable behaviour in the market and within those constraints... As environmental pressures grow more diverse and demanding, the quality of an individual company's supply chain response may confer significant competitive advantage.”

*The Supply Chain Response to Environmental Pressures Discussion Paper*, Julie Paquette, MIT Center for Transportation Logistics, [hdl.handle.net/1721.1/34530](https://hdl.handle.net/1721.1/34530)



## 2 SUSTAINABLE SCL RESULTS IN FINANCIAL, ENVIRONMENTAL AND SOCIAL BENEFITS

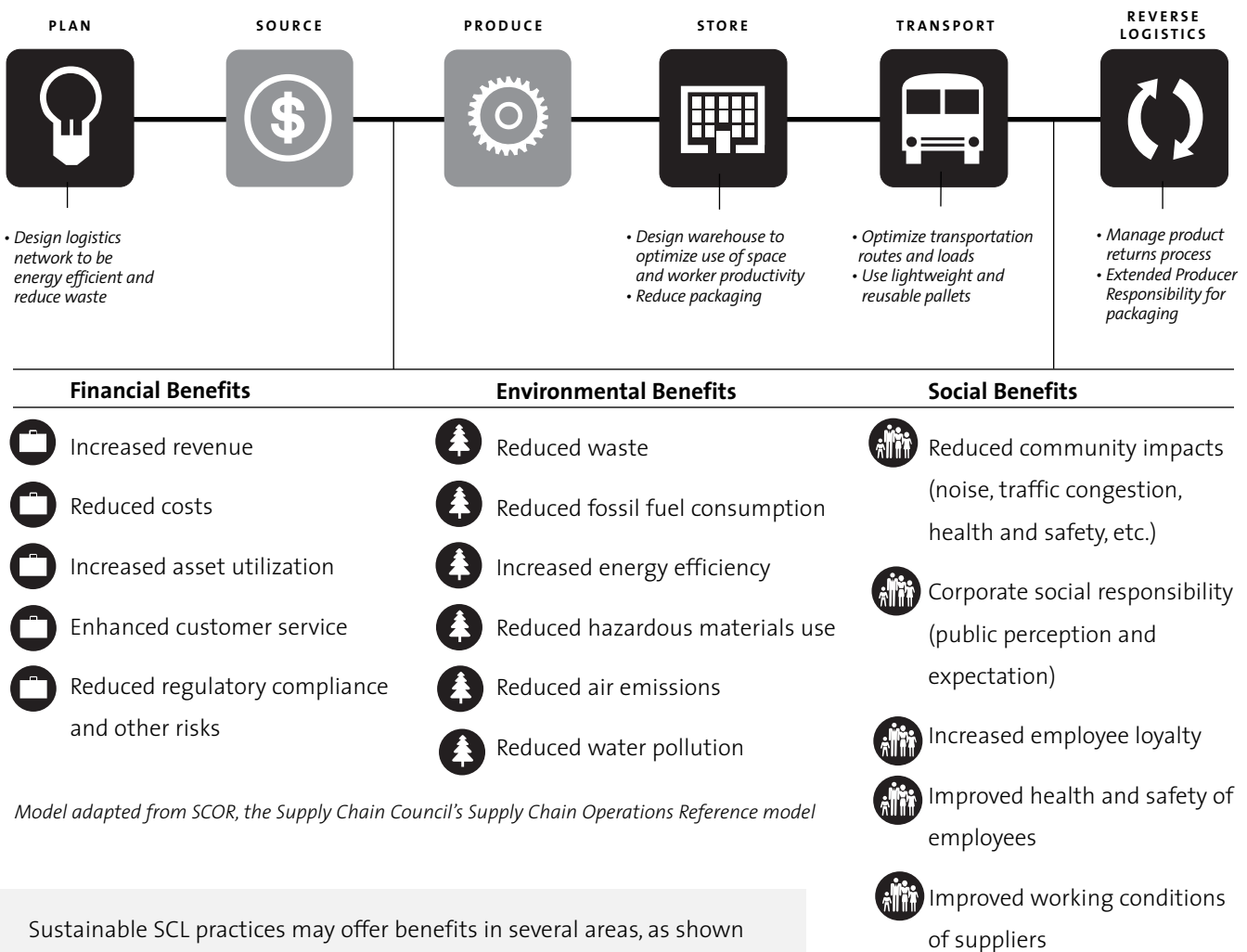
While environmental and social benefits can be direct outcomes of logistics process improvements, these types of benefits can be increased—along with financial benefits—by considering sustainability goals more explicitly within SCL practices.

In fact, there is mounting evidence that companies managing environmental and social variables along with more traditional economic factors show superior financial performance to those that fail to manage all three. For example, the Jantzi Social Index ([http://ca.ishares.com/product\\_info/fund/overview/XEN.htm](http://ca.ishares.com/product_info/fund/overview/XEN.htm))—created by Jantzi Research in partnership with Dow Jones Indexes and State Street Global Advisors—has outperformed both the S&P/TSX Composite and S&P/TSX 60 indexes since its inception in 2000.<sup>4</sup> The Jantzi Social Index tracks the stock price performance of a group of Canadian companies deemed environmentally and socially responsible.

### TYPES OF BENEFITS AVAILABLE FROM SUSTAINABLE SCL

Figure 3 shows some examples of how sustainable SCL practices can result in financial and sustainability benefits.

**Figure 3 – Sustainable SCL Practices Result in Financial, Environmental and Social Benefits**



Sustainable SCL practices may offer benefits in several areas, as shown in the table on the following page. For each practice listed in the left hand column of the table, the benefits, as denoted by the appropriate icons, are shown across financial, environmental and social aspects of your organization.

PRIMARY AREAS OF BENEFIT

SUSTAINABLE SCL PRACTICE		FINANCIAL					ENVIRONMENTAL							SOCIAL			
		Revenue Enhancement	Cost Reduction	Improved Customer Service	Improved Asset Utilization	Regulatory Compliance	Risk Reduction	Waste Reduction	Energy Efficiency	Emission Reduction	Fuel Conservation	Other Environmental Conservation	Reduced hazardous materials used	Reduced air emissions	Reduced water pollution	Social Impact Reduction (noise, congestion, health, etc.)	Engaged employees
	Plan 1 (p. 17)	Increase forecast accuracy															
	Plan 2 (p. 17)	Consider SCL in product lifecycle management															
	Plan 3 (p. 18)	Optimize SCL network design															
	Plan 4 (p. 19)	Implement an environmental management system															
	Store 1 (p. 21)	Incorporate sustainability factors in new warehouse development															
	Store 2 (p. 22)	Optimize warehouse layout and workflow															
	Store 3 (p. 23)	Increase energy efficiency of warehouse operations															
	Store 4 (p. 24)	Reduce inventory obsolescence or degradation															
	Store 5 (p. 24)	Handle and store hazardous materials safely															
	Store 6 (p. 25)	Automate inventory handling and management processes															
	Transport 1 (p. 27)	Manage lifecycle performance of delivery fleet															
	Transport 2 (p. 28)	Shift to modes or equipment that use less fossil fuel															
	Transport 3 (p. 29)	Reduce & optimize transportation loads and routes															
	Transport 4 (p. 30)	Reduce & use reusable or recyclable shipping materials															
	Transport 5 (p. 31)	Transport hazardous materials safely															
	Reverse Logistics 1 (p. 33)	Optimize efficiency of product returns															
	Reverse Logistics 2 (p. 34)	Implement high-value, low-waste disposition strategies															

## MEASURING THE BENEFITS

Many of the benefits of sustainable SCL are measurable at the company level. Others—particularly broad environmental conservation and social impact reduction—are more difficult to quantify. These include:

- **Increased brand differentiation.** Visible, proactive management of the environmental and social consequences of business operations can increase customer loyalty and brand goodwill, as well as mitigate the risks and financial impacts of avoidable environmental incidents and increasingly strict environmental regulations. The profile of Versacold's energy management initiatives on page 23 shows how this refrigerated storage company is managing its energy consumption—and winning positive public recognition as a result.
- **Strengthened customer relationships** through collaboration on sustainability solutions or provision of value-added services such as product or waste take-back programs. The profile of Catalyst Paper on page 32 show how Catalyst is deepening its relationships with customers by initiating sustainable SCL solutions.
- **Demonstrated corporate citizenship and responsiveness** to community, employee, public interest group and regulator concerns.
- **Improved ability to hold up to increasing scrutiny and due diligence** of a company's environmental and social practices.
- **Improved community health** through better air quality, particularly urban neighbourhoods located near busy freight delivery zones.
- **Improved health and safety conditions** for employees or logistics business partners.
- **Reduced impact on natural habitat and ecosystems.**
- **Reduced development of agricultural land** for warehouse facilities and transportation infrastructure.

Because these benefits are difficult to measure, they are often missing from the business case for sustainable SCL initiatives; however, they have value and should be considered in decision-making.

Nevertheless, some sustainable supply chain benefits can be measured and monitored over time as a means to confirm success and support continuous improvement. Refer to Section 8 for guidance on measurement system frameworks and selection of Key Performance Indicators (KPIs).



### 3 ASSESS YOUR COMPANY'S PERFORMANCE

What is your company already doing well and where can improvements be made? Use the check list in this section to assess your company's performance level for each of the best practices that have been presented and the importance of each practice to your company. This self-assessment can be completed in two ways - by manually filling in your ratings in the best practices list starting on the following page, or by accessing and completing the self-assessment online by accessing: [www.metrovancouver.org/smartsteps/pages/SSCLGuide.aspx](http://www.metrovancouver.org/smartsteps/pages/SSCLGuide.aspx). The online version offers the advantages of undertaking a sector-specific assessment (if you are a distributor, manufacturer or transportation company) and also print summary and detailed reports that present actions you can take to advance sustainable SCL.

To assess the **performance** rating of your company for each best practice, consider how your company compares with your peers and/or competition. For example, if you know you are leading in this area, assign it a 'high-performance' rating. If your company is significantly lagging in an area assign a low ranking.

The **importance** rating is used to assess practices which are most relevant to your company. Influencing factors can include: how big is the cost burden, stakeholders' concerns, internal motivations and external factors such as regulations and associated cost penalties. A practice that is of high importance is one that plays a key role in your operations and is driven by these factors. For example, if fuel costs are significant, then those practices related to fuel efficiency may be of high importance. In contrast, a low importance rating represents a practice that is not relevant and/or not of concern to your company.

It may be helpful to make note of the criteria used to rate performance, for example, key performance indicator data (see Section 10). This will help support consistency when future assessments are undertaken, either by the same individual, or potentially by a different individual.

After completing the checklist you may then analyze the results from your assessment (on page 15) to identify which sustainable SCL opportunities your organization should focus on. Details on those, and all best practices listed in the checklist are provided in Sections 4-7, inclusive.

	PERFORMANCE				IMPORTANCE				N/A
	Low	High	Low	High	Low	High	Low	High	
<b>PLAN 1</b>									
1. Integrate internal sales and operational planning processes and systems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Collaborate with customers on forecasting and planning.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Collaborate with suppliers on forecasting and planning.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Electronically collect and share sales, inventory, order, production and delivery data.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>PLAN 2</b>									
1. Consider logistics efficiencies in product and/or packaging design.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Base product design, purchasing and manufacturing decisions on lifecycle costs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>PLAN 3</b>									
1. Use supply chain optimization software to optimize location, distance, load, service and environmental variables in SCL network decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Outsource SCL functions that can be more efficiently and cost-effectively performed by third parties.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>PLAN 4</b>									
1. Collect and analyze data to understand environmental impacts and risks of SCL activities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Understand gaps between ISO 14001 requirements and your existing environmental management program.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Implement robust environmental management program to manage SCL impacts.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>STORE 1</b>									
1. Follow LEED criteria in building design.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Select site and situate building to minimize traffic and noise impacts on community.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Use building products and materials with recycled content.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Implement soil erosion measures.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Implement rainwater collection and storage systems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>STORE 2</b>									
1. Share excess warehouse space with other users.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Optimize safety and efficiency of warehouse layout.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Relate receiving and shipping operations to the flow of goods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Make full use of available warehouse height for cartons, pallets and racking.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Optimize efficiency of picking methodology.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Train employees on efficient workflow.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	PERFORMANCE				IMPORTANCE				N/A
	Low		High		Low		High		
<b>STORE 3</b>									
1. Designate responsibility for energy efficiency and conduct energy audit.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Use formal commissioning process for new buildings and/or recommissioning process for existing buildings.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Adopt techniques to measure and reduce energy consumption from lights, HVAC.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Adopt techniques to improve energy efficiency of loading processes.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Recover and reuse waste heat.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Implement energy efficient materials handling equipment.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>STORE 4</b>									
1. Reduce the number of stock-keeping units through vendor consolidation or standardization.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Include risk of obsolescence in calculating economic order quantities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Implement vendor-managed inventory or material return programs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Consolidate storage of inventory to controlled locations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>STORE 5</b>									
1. Replace hazmat with non-hazardous alternatives where possible.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Train warehouse workers on safe handling and storage of hazardous materials.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Inspect tanks or containers used to store hazardous materials and correct deficiencies.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Segregate containers used to store hazardous materials.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Schedule regular removal and proper disposal of hazardous waste.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>STORE 6</b>									
1. Implement bar coding, RFID, or MRP technology to track inventory precisely.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Implement automated storage and handling systems.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Use mechanical handling equipment powered by alternative energy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>TRANSPORT 1</b>									
1. Source vehicles with fuel-efficient and low-emission technologies or designs.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Perform regular preventive vehicle maintenance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Institute fuel-efficient practices and train and reward drivers on their use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Train drivers on fuel-efficient fleet practices.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Use fuel monitoring devices in vehicles.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Implement driver incentive programs to recognize fuel efficiency.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	PERFORMANCE				IMPORTANCE				N/A
	Low		High		Low		High		
<b>TRANSPORT 2</b>									
1. Choose fuel-efficient modes of transport.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Use freight vehicles fuelled by alternative energy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>TRANSPORT 3</b>									
1. Minimize/standardize product packaging, pallets and containers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Use load planning tools to optimize loads.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Maximize bi-directional load factors.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Use route planning tools to minimize transport distances.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Schedule deliveries to avoid peak traffic periods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Work with local suppliers to avoid longer inbound transport distances.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Influence suppliers' transport routes, modes and loading practices.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>TRANSPORT 4</b>									
1. Use reusable or, at minimum, recycled shipping containers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Use recyclable plastic pallets in place of wooden.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. If impractical to use reusable containers, enroll in a pallet or container pooling service.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Use reusable tie-down straps and bands.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Design packaging to be recycled.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>TRANSPORT 5</b>									
1. Understand and comply with applicable hazardous materials transportation regulations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Develop and implement a dangerous goods transportation security plan.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Train employees on safe handling and transportation of hazardous materials.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Use load planning software to guard against inappropriate co-loading of hazardous materials.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Inspect containers used to transport hazardous materials and correct deficiencies.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>REVERSE LOGISTICS 1</b>									
1. Design products and packaging to facilitate recovery and reuse/recycling.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Implement a product take-back program.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Ensure return reasons and disposition status are clear throughout returns process.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Implement a centralized returns centre.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Outsource product returns to a specialized third party.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>REVERSE LOGISTICS 2</b>									
1. Determine disposition strategy for whole product and for individual parts to determine best use.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Recondition, cannibalize, or recycle returned products.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Where reuse not possible, reclaim recyclable materials and safely dispose.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Donate serviceable returned products.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### ANALYZING THE OUTCOMES OF YOUR ASSESSMENT

Now you have completed your company's self-assessment, the next step is to identify improvement opportunities and areas that are priorities to focus on. It is suggested that you duplicate the matrix on the right on a blank sheet of paper in order to help you determine your action plan.

In each box of the matrix plot the practices from the assessment you have just completed. For example, if your company does not consolidate storage bins or configure pallets and racking for efficient use of the space, but you do have warehouses that could benefit from a more efficient layout, you may have chosen low *performance* and high *importance* for Store 1, Number 2: Optimize safety and efficiency of warehouse layout, you would then note this in the bottom right-hand quadrant.

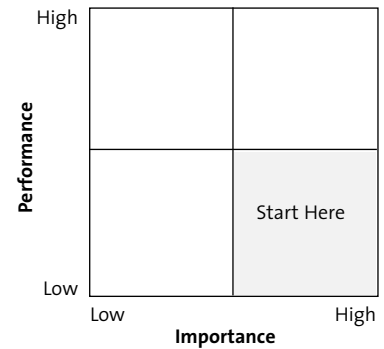
### IDENTIFYING PRIORITIES

There are several different ways to identify those sustainable SCL opportunities that should be prioritized. One suggestion is to bring together a cross-functional team to complete the self-assessment together or fill it out individually and compare results. This approach will help build consensus on priorities for action should be.

It is suggested that those in the lower right-hand corner (See shaded area) of the matrix (i.e. ranked as low performance / high importance) be considered the top priorities for focus.

#### DID YOU KNOW

Refer to Section 3 to map performance assessment scores in the matrix below. This will help you prioritize sustainable SCL opportunities.





## 4 BEST PRACTICES IN SUSTAINABLE SCL: PLAN



### NATURE'S PATH

#### Optimizing supply chain logistics network efficiency

With the help of a modeling tool that analyzed shipments and customer ordering patterns for a year, Richmond-based Nature's Path found the optimal location for a new distribution centre (DC).

The new DC is strategically located within 150 miles of Chicago, where it serves as a hub for the Midwest, home to the majority of Nature's Path's customers. These customers were previously serviced by truck from Nature's Path's Richmond DC. Distributing from the new Chicago hub enables Nature's Path to send efficient inventory shipments from Richmond to Chicago by rail. Also, warehousing product closer to the core market has cut delivery lead-time in half.

Many of Nature's Path's customers pick up products from the Chicago DC, further reducing their ecological footprints through consolidated pickups.



Customer service levels up: delivery lead-time reduced from three–five days to one and a half days



Emissions and fuel consumption down; 625 truckloads transferred to more fuel-efficient rail



Per unit freight costs down



Reduced traffic congestion

The “Plan” link in the supply chain includes activities performed at the strategic level. These activities drive the efficiency and effectiveness of SCL practices later performed at the tactical level. Best sustainable SCL practices and benefits associated with the “Plan” link are:

- Plan 1:** Increase forecast accuracy
- Plan 2:** Consider SCL in product lifecycle management
- Plan 3:** Optimize SCL network design
- Plan 4:** Implement an environmental management system



### PLAN 1: INCREASE FORECAST ACCURACY

Increasing the accuracy of supply and demand forecasts can reduce waste and inventory along the supply chain, increase supply chain visibility and responsiveness and enhance customer service.

An advanced supply chain management practice aimed at improving forecast accuracy is collaborative planning and forecasting. Greater collaboration can take place between a company’s internal functions, as well as between a company and its customers and suppliers. Successful collaboration is based on trust and long-term relationships and can take many forms, including sharing of information, materials, assets, capital, risks, technology or other resources.

Consider the following best practices to increase forecast accuracy.

- **Involve sales and marketing, operations and logistics departments** in developing integrated sales and operational plans.
- **Conduct a collaborative planning initiative with external supply chain partners (customers, suppliers and 3PLs)** to exchange forecast information.
- **Use technology to facilitate real-time sharing** of point-of-sales data, inventory levels, reorder status and production and delivery schedules. Improved information visibility can reduce speculative orders, excess production, unnecessary shipments and waste.



### PLAN 2: CONSIDER SCL IN PRODUCT LIFECYCLE MANAGEMENT

Lifecycle management takes the view that products need to be managed throughout design, production, operation, maintenance and end of life reuse or disposal. Product and packaging design (ie. amount, size, weight) affect the efficiency and effectiveness of a company’s SCL practices and, thus, logistics costs, waste, emissions and energy consumption.

Although a full discussion of product design is not within the scope of this Guide, consider the following best practices to incorporate SCL into product lifecycle management.

#### DID YOU KNOW

“If you could focus on only one lean attribute—and only one improvement—in your supply chain, it should be the demand management capability. Effectively managing the demand signal across your organization and then communicating that signal to your suppliers will reduce waste, cut costs and ultimately lead to higher supply chain performance.”

“What Makes a Lean Supply Chain?” Kate Vitasek, Karl B. Manrodt and Jeff Abbott, *Supply Chain Management Review*, October 1, 2005.



#### MORE RESOURCES

*Supply Chain Collaboration for Sustainability*, Gyöngyi Kovács, Business Strategy and the Environment Conference 2005

*Environmental Life Cycle Management: A Guide for Better Business Decisions*, Environment Canada.  
<http://www.ec.gc.ca/p2/default.asp?lang=En&n=BAEAB4C6-1>

*Life Cycle Costing, Looking Closely at Your Bottom Line*, BC Climate Action Toolkit.  
<http://www.toolkit.bc.ca/tool/life-cycle-costing>

*Tool for calculating Life-Cycle Costs and CO<sub>2</sub> Emissions of products*, SMART SPP – Innovation through sustainable procurement.  
<http://www.smart-spp.eu/index.php?id=7633>

Further lifecycle cost and management tools are provided in Section 9.








### NATURE'S PATH

#### Packaging design for logistics efficiencies and reduced waste

Richmond-based Nature's Path appointed a cross-functional team to redesign boxes for its food products. The team considered marketing, environmental and logistical goals to come up with packaging that offers financial and ecological benefits.

The result was a smaller package that produced the following results. Fewer raw materials are now used to package the same product weight. By optimizing the dimensions of boxed packaging, 72 units, rather than 66, can be stacked on a pallet. This configuration also makes full use of the pallet envelope, reducing product shifting and breakage.

At a time when competitors have been modifying their boxes to have larger packaging-to-product ratios, Nature's Path bucked the trend to create an offering that has been a winner for profits and for the environment. And, once feasibility issues are resolved, the company intends to take its initiative a step further by using compostable packaging liners.

-  10% less packaging used for boxed cereals = lower per unit costs
-  Less storage space used = improved asset utilization and postponed capital outlays
-  8% improvement in load factor on trucks = better asset utilization
-  Reduced emissions, fuel and energy consumption
-  Less product damage = less waste

### MORE RESOURCES

DB Schenker's Emission Calculation Online is a tool designed to help shippers determine the environmental impact of goods transportation. [www.ecotransit.org/target.en.phtml](http://www.ecotransit.org/target.en.phtml)

- **Design for logistics**, a lean manufacturing principle that uses product design to address logistics efficiency. Design for logistics addresses the amount of packaging, package weights and dimensions and product standardization for efficient warehousing and transport and product suitability for efficient take-back, reuse, or recycling. The Nature's Path profile in the sidebar provides a good example of this practice in action.
- **Use lifecycle cost analysis** to reduce the total cost of product design, production, logistics, operation and disposal over its lifecycle. Lifecycle costing allocates total costs—including those traditionally grouped as “overhead” such as waste disposal, training, environmental permitting and waste and water treatment—to the products and processes responsible for generating the costs. This allows decisions about product design, purchasing and manufacturing to be based on a truer picture of costs over a product's lifecycle.



### PLAN 3: OPTIMIZE SCL NETWORK DESIGN

Merger activities, customer demands, pressures to reduce inventory and free up capital and rising energy and fuel costs are common incentives for a company to examine its logistics network—that is, the number, type and location of manufacturing and distribution facilities and the transportation channels and modes used to service customers. Network design also considers whether a company should manage its SCL in house, or whether SCL activities should be outsourced to one or more third party logistics (3PL) providers.

Including environmental and social impacts in SCL network analysis can allow companies to reduce environmental and social impacts while still achieving financial objectives.

Consider the following best practices to optimize the efficiency of your SCL network.

- **Use supply chain optimization software** that considers distance, weight and cube volume, asset mix, location and customer service variables. New tools (such as DB Schenker's online emission calculator; see sidebar) also consider fuel and energy consumption and emissions in SCL network design. These tools can support decisions to change the number or type of sites, distribution channels, or transportation modes; to use capacity more efficiently; or to extend the life of existing assets.
- **Assess the costs and benefits of outsourcing** some or all SCL activities to one or more 3PLs, particularly those aspects that are non-core to your business. This will not only enhance your company's supply chain agility; consolidating warehousing and transportation activities with other companies, through a 3PL, typically uses warehouse and transport space more

efficiently, thus reducing costs, GHG emissions and energy consumption. In addition, reduced traffic and higher levels of training for 3PL truck drivers versus private fleet drivers have been found to result in fewer traffic fatalities.<sup>5</sup>



## PLAN 4: IMPLEMENT AN ENVIRONMENTAL MANAGEMENT SYSTEM

An environmental management system (EMS) is a framework for managing environmental issues within a well-documented, organized structure.<sup>6</sup> An EMS can help improve environmental performance, reduce business risks, enhance customer relationships, reduce costs through increased efficiencies and enhance a company's image with employees, regulators, investors, the public and other stakeholders.

Establishing an EMS involves complying with an existing certification program or implementing self-defined standards. Existing ISO freight & logistics certification program (ISO14001:2004) is the most common certification-based EMS standard. All EMS models follow a “Plan, Do, Check, Feedback” cycle of continuous improvement.

While there is currently no specific EMS certification or accreditation in Canada designed for SCL, the Australian Logistics Council (ALC) has endorsed ISO 14001 as the most appropriate and ideally suited to logistics<sup>7</sup> and has developed a national freight and logistics accreditation scheme to ISO 14001.

Before proceeding, a company should identify why an EMS is required and determine the appropriate level of implementation (i.e., a full or partial EMS, with or without certification). For example, are customers demanding it in their purchasing policies? Does the company want to sell in international markets where ISO 14001 is seen as a competitive necessity? Are there specific risks that the company is trying to manage?

Consider the following actions to determine whether to implement an EMS and the required level of implementation.

- **Determine your company's requirements for an EMS by** identifying the internal and external drivers of implementation.
- **Assess the opportunities, challenges, costs and benefits of fully or partially implementing an EMS,** with or without certification.
- **Set goals for the desired level of EMS** implementation.
- **Implement the desired level of EMS by following the Plan, Do, Check, Feedback loop** of continuous improvement.

### DID YOU KNOW

Most suppliers who have implemented ISO 14001 at the behest of their customers have found that it has “produced positive financial returns for their company by helping them better manage environmental issues, identify opportunities for greater efficiency and identify pollution prevention measures that would save money.”

*Suppliers' Perspectives on Greening the Supply Chain,*  
Business for Social Responsibility Education Fund,  
June 2001.

### PUROLATOR

#### Modeling its environmental management system on ISO 14001

Purolator has put in place an Environmental Health & Safety (EH&S) Management System, a set of documented policies for controlling environmental impacts. Modeled after the ISO 14001 standard, the EH&S system is designed to meet legal obligations and company standards and to promote continuous improvement.

The standards address environmental management processes such as air emissions, hazardous waste, non-hazardous waste, spills response, storage tanks and wastewater effluent.

The company's EH&S department identifies significant environmental impacts and health and safety risks, sets standards and audits programs. The facilities and engineering department implements procedures related to air emissions, storage tanks and wastewater.



Improved controls to avoid or mitigate environmental impacts



Reduced costs from environment, health and safety incidents



Improved the health, safety and working conditions of employees



### MORE RESOURCES

International Standards Organization (ISO),  
[www.iso.org](http://www.iso.org)

Environment Canada, EMS Info Page,  
[www.ec.gc.ca/planp2-p2plan/default.asp?lang=En&n=DBCAB7F5-1](http://www.ec.gc.ca/planp2-p2plan/default.asp?lang=En&n=DBCAB7F5-1)

Canadian Standards Association,  
[www.csa.ca/standards/environment](http://www.csa.ca/standards/environment)



## 5 BEST PRACTICES IN SUSTAINABLE SCL: STORE

### LONDON DRUGS

#### Minimized building footprint from storage innovations

Yearly new store openings presented London Drugs (LD) with the challenge of serving more retail outlets from its Richmond distribution centre (DC). To avoid new building expansions, LD found ways to compress its inventory within the existing facility.

For example, LD makes full use of the warehouse height with less-than-case-lot order picking areas built on multi-level work platforms that are designed into the DC's network of conveyors.

Another example is LD's small-item storage. Thousands of small items are stored in compact carousel racks with no aisle space between racks. A picker is stationed at one end of oval-shaped carousels that rotate via computerized sequence instructions to give access to the next item on the picking list. With this method, a single picker can efficiently work a batch of up to ten orders at a time.

Finally, cartons received as less-than-full pallets are removed from the standard warehouse racking and brought to the case lots area to be individually slotted into smaller shelves, leaving the full height of pallet racks to be used for full-pallet storage and retrieval.



Increased asset utilization and productivity



Delayed capital cost of distribution centre expansion originally forecast for 1996



Avoided environmental and community impacts that would have resulted from new heavy construction

The “Store” link in the supply chain concerns the selection, design and configuration of warehouse space; management of inventory receiving, picking and packing functions; and management of raw materials or finished goods inventory. There are significant opportunities to improve the energy efficiency and reduce the environmental and social footprints of warehouse facilities. Best practices associated with the “Store” link are:

- Store 1:** Incorporate sustainability factors in new warehouse development
- Store 2:** Optimize warehouse layout and workflow
- Store 3:** Increase energy efficiency of warehouse operations
- Store 4:** Reduce inventory obsolescence or degradation
- Store 5:** Handle and store hazardous materials safely
- Store 6:** Automate inventory handling and management processes



### STORE 1: INCORPORATE SUSTAINABILITY FACTORS IN NEW WAREHOUSE DEVELOPMENT

When developing a new warehouse, incorporating objectives of sustainability, security, productivity, accessibility, functionality and cost-effectiveness early on can result in a more secure, healthier working environment than when focusing too narrowly on any single objective.

Consider the following best practices to minimize the environmental and social impacts of a new warehouse. These practices also correspond with many elements in the LEED building rating system developed by the U.S. Green Building Council and adapted by LEED Canada. LEED can be used as a design guide when developing a new or retrofitting an existing warehouse facility.

- **Reuse existing buildings and sites where possible.**
- **For green field projects, select the site and situate the building** to minimize traffic and noise impacts on the community.
- **Implement measures to avoid erosion of soil** that could destroy vegetation, degrade property, cause sedimentation of local water bodies, destabilize building foundations, or impact structural integrity, all of which have liability and insurance cost implications.
- **Implement water efficiency measures**, such as integrated rainwater collection and storage systems, to reduce the municipal water supply and wastewater treatment requirements.



### MORE RESOURCES

Metro Vancouver BuildSmart,  
[www.metrovancouver.org/buildsmart/Pages/default.aspx](http://www.metrovancouver.org/buildsmart/Pages/default.aspx)

BC Ministry of Energy, Mines and Petroleum Resources, Energy Efficient Buildings: A Plan for BC,

Building Owners and Managers Association of BC (BOMA), Go-Green program,  
[www.boma.bc.ca/gogreen.php](http://www.boma.bc.ca/gogreen.php)

Canada Green Building Council,  
[www.cagbc.org](http://www.cagbc.org)

U.S. Green Building Council,  
[www.usgbc.org](http://www.usgbc.org)

Balancing Security / Safety and Sustainability Objectives, Whole Building Design Guide,  
[www.wbdg.org](http://www.wbdg.org)

Buildinggreen.com,  
[www.buildinggreen.com/auth/article.cfm?fileName=040501a.xml](http://www.buildinggreen.com/auth/article.cfm?fileName=040501a.xml)

Green Buildings Foundation,  
[www.greenbuildingsfoundation.org](http://www.greenbuildingsfoundation.org)



### CATALYST PAPER

#### Smart inventory put-away practices to increase warehouse utilization

By reducing the number of SKUs (stock-keeping units), consolidating storage bins and improving put-away practices, Catalyst has realized excellent storage efficiencies in its finished goods warehouse in Surrey. The company can now store 20% more product within its walls without having to expand or use more heat or lighting.



Energy efficiency: use of storage capacity improved by 20%



Avoided capital costs of new warehouse space

### DID YOU KNOW

Lean principles are increasingly being applied in the warehouse. Lean warehousing techniques include:

- Improving warehouse layout to reduce the amount of handling to pick and ship products.
- Optimizing areas in the warehouse that have predictability (e.g., commonly ordered quantities).
- Applying the “touch-once” principle to reduce wasted motion.
- Implementing warehouse optimization software to synchronize delivery of raw materials, parts and components with products coming down the manufacturing line and further with outbound transportation processes.

“Warehousing Gets Lean,” Bob Trebilcock, *Modern Materials Handling*, December 1, 2004. Available by contacting Modern Materials Handling (see [www.mmh.com](http://www.mmh.com))

- **Design or reconfigure facilities to green standards and to be energy efficient.** For example, a light-coloured roof reflects solar radiation and will reduce HVAC loads, energy consumption and operating costs. For large roof areas, the effect can be significant, especially for temperature controlled warehouses. Greater heat reflection can also increase worker productivity in the summer. The installation of an accessible roof garden has similar benefits and additional advantages for storm water management.
- **Minimize the amount of building materials used and waste produced and use building products and materials with post-consumer recycled content** or other environmentally preferable characteristics.
- **Establish good indoor air quality** and eliminate sources of indoor air pollution.



### STORE 2: OPTIMIZE WAREHOUSE LAYOUT AND WORKFLOW

Warehouse layout and operations impact energy efficiency and worker productivity. Inefficient use of space results in excess utility and labour costs, slower customer service, lower asset utilization, higher capital requirements and a bigger physical footprint on the environment.

Consider the following best practices to optimize the efficiency of warehouse layout and workflow and to remove wasteful steps from goods handling processes.

- **Where possible, share** warehouse space with other users.
- **Organize warehouse layout** for safe and efficient circulation and inventory picking and put-away and to minimize repetitive handling.
- **Relate interior and exterior receiving and shipping operations** to the flow of goods through the warehouse.
- **Configure cartons, pallets and racking** to make full use of available height. As noted in Transport 4 on page 30, reusable shipping containers are typically standardized and designed for more efficient stacking.
- **Optimize picking methodology for energy efficiency and productivity**
  - Order pick (single picker, single order)
  - Batch pick (single picker, multiple orders)
  - Zone pick (multiple pickers, single or multiple orders but passed zone to zone)
  - Wave pick (multiple pickers, multiple orders).
- **Train employees** on efficient workflow processes and procedures.

### STORE 3: INCREASE ENERGY EFFICIENCY OF WAREHOUSE OPERATIONS

Common warehouse systems (e.g., HVAC, lighting and security) and equipment (e.g., conveyors and forklifts) consume significant amounts of energy and contribute to high operating costs. Implementing energy-efficiency measures related to warehouse operations can result in cost savings of 20% or more<sup>8</sup> and reduce the draw on energy resources.

Consider the following best practices to make your warehouse operations more energy efficient.

- **Designate an energy manager** and conduct an energy audit to identify opportunities to be more efficient.
- **Use a formal building commissioning process** for new buildings or a regular recommissioning process for existing buildings to ensure and document that all building systems perform according to specification and design intent. A formal commissioning process can improve new building energy performance by 8–30%.<sup>9</sup>
- **Plan loading dock space** to reduce energy consumption in colder months and provide more tolerable working conditions for dock workers. For example, loading berths should be covered at least 1.2 m beyond the platforms of open loading docks; dock seals could be used at each loading bay; or, for very cold climates, the entire loading bay could be enclosed.
- **Install rapid action loading doors** that minimize the time doors are open for the approach or departure of delivery vehicles, thus controlling exposure to weather and reducing energy costs.
- **Use energy-efficient lighting fixtures**, such as motion-sensor or timed lighting systems. Use natural light where feasible.
- **Turn off lights and HVAC** when not in use.
- **Use direct digital control systems** and link HVAC systems with the warehouse operating schedule.
- **Use natural ventilation** versus energy-intensive mechanical ventilation. Natural ventilation can provide acceptable indoor air quality and use less energy, though precautions must be taken to protect against outside contaminants.
- **Use ceiling mounted fans** to reduce heat stratification and provide air circulation.
- **Recover waste heat generated by refrigerated storage systems** to heat water, provide space heat or power other processes.



#### VERSACOLD

##### Cooling energy consumption

With 23 refrigerated-storage depots and more than 1.8 million cubic metres of refrigerated space, Vancouver-based Versacold was spending up to 30% of operating costs on energy to store customers' frozen food products. Responsible energy use, consequently, is a corporate priority. Innovations of their comprehensive energy management program include:

- temperature monitoring equipment
- computer control and energy monitoring for refrigeration equipment
- automatic cooler/freezer doors
- thermal energy storage during off-peak periods
- new lighting that emits less heat
- recovery of waste heat from cooling facilities
- use of environmentally friendly refrigerants
- annual energy reduction targets for facility managers
- recognition of employees' energy efficiency ideas



Energy use down 14.3% between 1998 and 2002



Energy costs down \$1.3 M between 1998 and 2002



GHG emissions down 30,000 tonnes between 1998 and 2002



Public recognition: Winner of 2003 National Energy Efficiency Award from Natural Resources Canada



Reduced consumption at peak demand periods relaxes the need for new power generation, distribution and transmission infrastructure



Enhanced public profile for the company

## MORE RESOURCES

BC Hydro Power Smart,  
[www.bchydro.com/business/](http://www.bchydro.com/business/)

Natural Resources Canada Office of Energy  
Efficiency, [www.oee.nrcan.gc.ca](http://www.oee.nrcan.gc.ca)

Metro Vancouver Warehousing/Wholesaling  
SmartSteps Guide,  
[www.metrovancouver.org/about/  
publications/Publications/SG-Warehousing1.pdf](http://www.metrovancouver.org/about/publications/Publications/SG-Warehousing1.pdf)

## MORE RESOURCES

*The Lean and Green Supply Chain* from the U.S. Environmental Protection Agency provides an example of how the standard EOQ model can be adapted to include costs associated with material obsolescence and subsequent disposal.

## MORE RESOURCES

BC Ministry of Environment, Environmental  
Protection Division, Hazardous Wastes home page,  
[www.env.gov.bc.ca/epd/hazwaste/](http://www.env.gov.bc.ca/epd/hazwaste/)

- **Maximize the energy efficiency of materials handling equipment** such as conveyors, palletizers and automated storage systems. For example, AC induction motors have become the standard for use in materials handling equipment due to their superior energy efficiency and operation. Sensors, adjustable speed drives and soft-start capabilities allow conveyors to be turned off or run at lower speeds when not in use, thus conserving energy while minimizing damage to conveyor systems and products.<sup>10</sup>



## STORE 4: REDUCE INVENTORY OBSOLESCENCE OR DEGRADATION

Excess inventory and low inventory turnover can result from poor management of reorder points, order quantities, storage locations or data. Improving inventory management will increase turnover and reduce obsolescence or degradation, leading to less waste, improved warehouse utilization and lower capital, labour and utility costs.

Consider the following best practices to improve inventory management and reduce obsolescence and degradation.

- **Analyze purchasing patterns** to detect and implement opportunities for vendor consolidation or standardization that will result in fewer stock-keeping units.
- **Include risk of obsolescence** in calculating economic order quantities (EOQ). See the sidebar for a useful resource.
- **Implement vendor-managed inventory programs** or require suppliers to adhere to material return policies that reduce incentives to stock excess inventory.
- **Consolidate storage of inventory** within controlled locations to avoid wasting storage space or hidden build-up of inventory that may become obsolete and eventually require disposal.



## STORE 5: HANDLE AND STORE HAZARDOUS MATERIALS SAFELY

Manufacturers store a variety of paints, fuels, solvents and other chemicals for use in operations or asset maintenance. Where the use of non-hazardous alternatives is not an option, safe handling and storage of hazardous materials (hazmat) is essential to prevent worker health and safety issues, operational downtime, environmental contamination from spills or leaks, higher insurance premiums and higher environmental permitting costs—not to mention damage to a company's brand equity.

Consider the following best practices to handle and store hazmat safely and to minimize waste and pollution.

- **Where possible, replace hazmat** with non-hazardous alternatives.
- **Train warehouse workers** on safe handling, proper storage techniques and spill and leak prevention.
- **Inspect tanks or containers** used to store hazmat to detect and correct the potential for liquid or vapour leaks.
- **Segregate containers** used to store hazmat from those used to store non-hazardous supplies and ensure proper cleaning procedures are used prior to reuse or disposal.
- **Schedule regular hazmat waste removal and disposal** to comply with regulations regarding how long hazmat may be stored on site.



## STORE 6: AUTOMATE INVENTORY HANDLING AND MANAGEMENT PROCESSES TO IMPROVE EFFICIENCY

Automating paper- or labour-intensive inventory processes can provide financial and sustainability benefits. Automated warehouse operations can be run in darkness or non-heated environments, resulting in energy savings.<sup>11</sup> Automated inventory systems also enhance product traceability in the event of a recall.

Consider the following ways to automate inventory handling and management processes to improve efficiency.

- **Use bar coding, radio frequency identification (RFID), or material requirements planning (MRP)** technology to track inventory levels and locations with high precision. Improved inventory visibility can increase service levels and customer satisfaction, reduce obsolescence and waste, reduce the number of expedited shipments by fuel-intensive modes like air freight and reduce safety stock along the supply chain. Bar coding and RFID technologies can also reduce paper consumption used for manual inventory processes.
- **Implement automated storage and handling systems** that sort, direct and retrieve inventory with less repetitive handling and lower energy consumption for lighting and HVAC than manual labour. The profile of London Drugs on page 20 is a good example of this practice in action.
- **Use mechanical handling equipment** powered by alternative energy sources. The profile of General Hydrogen in the sidebar provides a good example.

### GENERAL HYDROGEN

#### Alternative energy solutions for warehouse performance improvement

The first sale of Hydricity packs, the name of Richmond-based General Hydrogen's fuel cell system, has just been made to Bridgestone to power its warehouse forklifts.

Although the initial cost of General Hydrogen's technology is greater than the lead acid battery technology it replaces, there are multiple operational benefits to using Hydricity packs:

BATTERY	FUEL CELL
Takes up to 8 hours to be recharged	Refuelling takes only a few minutes
Expected life is 1.5 years	Current life is 4–5 years; industry targeting 10-year lifetime
Hazardous waste is stored in the battery and disposed of at end of life	Only by-product is pure water



Less waste



Reduced community exposure to hazardous waste



Fewer total units required to run a fleet; lower replacement inventory



Extended useful life of lead acid batteries



## 6 BEST PRACTICES IN SUSTAINABLE SCL: TRANSPORT

### PUROLATOR

#### Three-year payback from hybrid-electric delivery vehicles

Purolator is now on the road with 19 hybrid electric vehicles (HEVs) in its in-city pickup and delivery fleet, with 55,000 in-service kilometres travelled since May, 2005.

Powered by Burnaby-based Azure Dynamics technology, the HEVs use half the fuel of gas-powered vehicles. Maintenance costs are also down due to longer oil change intervals, longer brake pad life and a lower parts-to-service ratio. With the business case based only on financial factors (the company expects pay-back within three years), the environmental benefits from reduced GHG emissions are a valued bonus.

Purolator is putting 115 more HEVs on the road in 2006 and 400 more units per year thereafter to replace its entire 3,000-unit in-city fleet.



Fuel consumption down by 40-45% and GHG emissions down by 50%



Reduced fuel costs



Maintenance costs down by an estimated 20%



Improved health and safety of working environment

The “Transport” link in the supply chain involves fleet vehicle management and the inbound and outbound transportation of goods. The following best practices apply to in-house or outsourced transportation.

**Transport 1:** Manage lifecycle performance of delivery fleet

**Transport 2:** Shift to modes or equipment that use less fossil fuel

**Transport 3:** Optimize transportation loads and routes

**Transport 4:** Use reusable or recyclable shipping materials

**Transport 5:** Transport hazardous materials safely



## TRANSPORT 1: MANAGE LIFECYCLE PERFORMANCE OF DELIVERY FLEET

Whether operated in-house or by third parties, the way that a delivery fleet is managed contributes significantly to the cost and environmental impacts of transporting goods. Fleet management encompasses sourcing, maintenance, operation and disposal of fleet vehicles. Effective fleet management can reduce fuel use and vehicle emissions, reduce maintenance costs, increase vehicle reliability and customer service, increase vehicle life and salvage value and improve the safety of equipment operators and the public.

Consider the following best practices to manage the lifecycle performance of your delivery fleet.

- **Specify fuel-efficient fleet technologies** and design improvements when sourcing new fleet vehicles, such as increased aerodynamics, vehicle weight reductions, improved engine and transmission designs, improved rolling efficiency of tires and more efficient accessories.
- **Perform regular preventive fleet maintenance** and inspections, including items like tire pressure, which should be checked frequently. Proper tire inflation is essential for fuel economy, safe vehicle handling and long tire life.
- **Provide driver training** on fuel-efficient driving techniques (e.g., block shifting or progressive shifting).
- **Reduce unnecessary idling of delivery vehicles.** Turn engines off during pick-ups and deliveries. Avoid running the engine for cooling, heating or charging batteries by installing separate cab heaters and air conditioners, engine timers that turn engines off after a cool-down period and timing devices to maintain pre-set temperatures or battery charges.

## PUROLATOR

### Committed to greening the fleet

High company standards and well-honed maintenance methods are the foundation of Purolator’s Greening the Fleet initiative for pollution prevention. Fleet management practices include:

- Computer-scheduled preventative maintenance is performed in addition to manufacturers’ suggested maintenance.
- Drivers are trained on pre-trip vehicle inspection procedures to verify fluid levels, lights and steering functions and to check for leaks and tire bulges daily. A poorly maintained vehicle can produce up to 50% more harmful emissions than one that is well maintained.
- A formal no-idling policy requires that vehicles be turned off when stopping for a delivery.
- Defensive driver training encourages drivers to maintain steady, safe-driving speeds, which enhances fuel efficiency.



Reduced costs of vehicle downtime



Reduced fuel consumption



Reduced air and noise pollution



Fewer preventable accidents



Reduced local traffic congestion

## DID YOU KNOW

Regular maintenance may improve fuel efficiency by up to 1.5%.

*Fuel Efficiency Benchmarking in Canada’s Trucking Industry*, March 2000, Natural Resources Canada Office of Energy Efficiency, [oe.nrcan.gc.ca/transportation/business/documents/case-studies/fuel-efficient-benchm.cfm?attr=16](http://oe.nrcan.gc.ca/transportation/business/documents/case-studies/fuel-efficient-benchm.cfm?attr=16)



## MORE RESOURCES

Natural Resources Canada Office for Energy Efficiency FleetSmart program, [oe.nrcan.gc.ca/transportation/business/heavy.cfm?attr=16](http://oe.nrcan.gc.ca/transportation/business/heavy.cfm?attr=16)

Transport Canada Freight Efficiency Program, [www.tc.gc.ca/eng/mediaroom/releases-nat-2004-04-h019e-3972.htm](http://www.tc.gc.ca/eng/mediaroom/releases-nat-2004-04-h019e-3972.htm)

Metro Vancouver Transportation SmartSteps Guide, [www.metrovancouver.org/about/publications/Publications/SG-Transportation1.pdf](http://www.metrovancouver.org/about/publications/Publications/SG-Transportation1.pdf)

## CATALYST PAPER

### Shifting volumes off the road

In an effort to avoid time-consuming and fuel-burning road congestion, Catalyst is successfully shifting shipments to alternative modes.

In one mode optimization initiative, shipments from Catalyst's Port Alberni mill to its Surrey warehouse are now delivered straight to the riverside warehouse by barge, bypassing the road altogether.

In a second mode optimization initiative, 7% more of the over one million tonnes of paper shipped from the Surrey warehouse to North American locations each year was transported by rail as opposed to truck in 2005 compared to 2004. This has reduced road congestion and has won favour with customers, who are able to gain efficiencies in receiving and handling due to the larger rail shipments.



Reduced road congestion, fuel consumption and emissions: 10,700 fewer 53' trucks on River Road and 3,800 fewer long-haul trucks leaving Surrey per year



Eliminated barge drayage costs of over \$2 M



Improved customer service levels, greater predictability



30-40% cost reduction on volume shipped by rail versus truck



Improved corporate social responsibility and public perception

- **Implement policies to restrict maximum vehicle speed** or program engines not to exceed certain speeds.
- **Install on-board or dashboard fuel monitoring devices** and train drivers on their use.
- **Implement driver incentive programs** to reward or recognize fuel efficiency gains or fuel-efficient driving techniques.



## TRANSPORT 2: SHIFT TO MODES OR EQUIPMENT THAT USE LESS FOSSIL FUEL

Ninety-five percent of transport worldwide is fuelled by oil.<sup>12</sup> Rising oil prices and public policies aimed at reducing vehicle emissions and fossil fuel use are strong incentives to explore freight transport alternatives that consume less fossil fuel.

Consider the following best practices to reduce the fossil fuel consumption of freight transport.

- **Shift loads to more fuel-efficient modes.** For example, shifting from heavy-duty truck to rail and further from rail to marine (especially barge), uses less fuel, produces fewer emissions and reduces traffic congestion.<sup>13</sup> The profile of Catalyst in the sidebar illustrates this practice.
- **Use freight vehicles fuelled by alternative energy**, such as those listed in the following table, to reduce costs, fuel consumption and emissions of freight transport by road.<sup>14</sup> The profile of Purolator on page 26 is a good example of a company achieving benefits through the use of alternative-energy vehicles.

### ALTERNATIVE ENERGY/TECHNOLOGY

**Biodiesel** is made from low-cost waste materials such as slaughterhouse waste, recycled cooking oil, animal fats, trap grease and oilseed crops.

**Ethanol** is a blend of liquid alcohol and gasoline.

**Hybrid electric vehicles (HEVs)** combine a battery with a conventional internal combustion engine.

**Hydrogen fuel cells** generate electricity by electrochemically combining hydrogen and oxygen.

**Battery-electric vehicles** are powered by a motor that draws electricity from on-board storage battery.

**Liquefied natural gas** is being tested for heavy-duty trucks in line-haul applications using Vancouver-based Westport Innovations technology.

**Propane**

### BENEFITS

Lowers GHG emissions while also addressing waste management issues

Burns more cleanly than gasoline or diesel. Growing grain or other biomass used to make ethanol absorbs carbon dioxide, further reducing GHG emissions.

Combines extended driving range and rapid refuelling of conventional fuels with environmental benefits of electricity.

Little to no tailpipe emissions except for heat and water vapour. Little to no GHG emissions depending on the source of hydrogen.

Lowers GHG emissions/smog-forming pollutants.

Produces fewer toxic pollutants and GHG emissions than gasoline or diesel. Costs about 30–40% less than gasoline.

Produces 20% fewer GHG emissions and fewer toxic pollutants than gasoline.



## MORE RESOURCES

Fleet Challenge Canada,  
[www.fleetchallenge.ca](http://www.fleetchallenge.ca)

BioFleet,  
[www.biofleet.net](http://www.biofleet.net)

Natural Resources Canada Office of Energy Efficiency,  
[oee.nrcan.gc.ca/transportation/business/fuels.cfm?attr=16](http://oee.nrcan.gc.ca/transportation/business/fuels.cfm?attr=16)

Fuel Cells Canada,  
[www.fuelcellscanada.ca](http://www.fuelcellscanada.ca)

Clean Air Corridor Demonstration Project  
[www.tc.gc.ca/eng/programs/environment-ecofreight-road-tools-casestudies-enbridge-552.htm](http://www.tc.gc.ca/eng/programs/environment-ecofreight-road-tools-casestudies-enbridge-552.htm)



## TRANSPORT 3: OPTIMIZE TRANSPORTATION LOADS AND ROUTES

The biggest factor affecting the sustainable management of freight transport is load factor—the percentage of the capacity of a truck, rail car, or air or marine container that is used. A one-quarter-full truck uses two-and-a-half times as much fuel per tonne-kilometre as a three-quarter-full truck, yet more than 50% of trucks on Canadian roads are less than half full.<sup>15</sup>

Increasing load factors as well as decreasing distances travelled will result in improved asset utilization, lower costs per unit shipped, reduced fuel consumption, lower emissions and reduced community impacts from noise and traffic congestion.

Consider the following best practices to optimize the efficiency of inbound and outbound freight transport loads and routes.

- **Avoid unnecessary product packaging** and use standardized and modularized packaging, pallets, or containers to optimize transport load factors. See Transport 4 on page 30 for more ideas about reusable packaging and shipping containers.
- **Use load planning software** to optimize loading of railcars, trucks, or air or marine containers in terms of weight, dimension, safety and legal variables. Load planning software can even take hazmat requirements into consideration to determine what can—or cannot—be co-loaded.
- **Maximize bi-directional load factors** through the use of common carriers (versus typically under-utilized private fleets), backhauls, co-shipping, double-stacked containers and Internet-based load-matching services.
- **Use route planning software** to reduce total transport distances.
- **Schedule freight delivery times** to reduce traffic congestion during peak periods.
- **Work with local suppliers** to shorten inbound transport distances.
- **Investigate and influence suppliers' transportation modes, loading and routes** for inbound materials to gain full benefits of sustainable transportation.



### CATALYST PAPER

#### Optimizing container and rail car loading to be more freight efficient

Through improved manual load planning, Catalyst—a Vancouver-based producer of newsprint and other specialty mechanical papers—is increasing container and rail car load factors. By taking ownership of 900 purpose-built rail cars, Catalyst can now take advantage of greater standardization and a higher cube design to maximize the loading of its round paper rolls.

The effect is more tonnes of paper per rail car and less damage in loading or transit—both of which increase customer satisfaction and reduce environmental impacts. Container yields have also improved by paying closer attention to load restrictions in end user markets.

With variables to consider such as destination-specific load restrictions, customer order sizes and multiple paper roll weights and dimensions, new load optimization software will help Catalyst take load planning to the next level.



\$500,000 cost reduction to ship same volume of paper



Reduced congestion and emissions: 245 fewer containers shipped in 2005 vs. 2004



Improved asset utilization: 4% increase in rail car yields



Less waste due to fewer damaged rolls



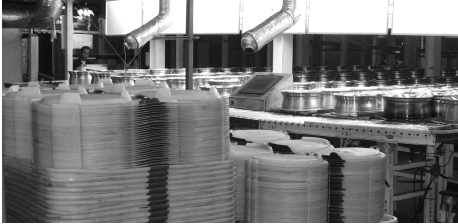
Increased customer satisfaction from cost savings, reduced damage and improved handling efficiencies



### MORE RESOURCES

Victoria Transport Policy Institute, particularly the Transportation Demand Management Encyclopaedia, Freight Transport Management chapter, [www.vtpi.org/tdm/tdm16.htm](http://www.vtpi.org/tdm/tdm16.htm)

The Centre for Sustainable Transportation, [www.centreforsustainabletransportation.org](http://www.centreforsustainabletransportation.org)



### CANADIAN AUTOPARTS TOYOTA (CAPTIN)

#### Returnable packaging solutions

As part of its ISO 14001 initiative, Delta-based CAPTIN is now using returnable packaging to transport the 6,000 aluminum wheels it ships to customers each day.

Working with a Langley-based supplier, CSL Plastics, CAPTIN came up with a plastic pallet and divider system to replace cardboard cartons and wooden pallets that customers had to recycle or dispose of themselves.

Due to their ten-year expected lifespan, the reusable pallets provide payback in less than two years compared to conventional packaging. Once payback is achieved, they also provide lower per unit costs. In addition, both employees and customers prefer the improved ergonomics of the new packaging and CAPTIN has realized productivity gains in the packaging process.



Lower per unit lifecycle cost



Less waste in landfills; reusable packaging for 6,000 units means 1,000 fewer cardboard boxes and 200 fewer wooden pallets used each day



Improved customer satisfaction



Improved ergonomics and employee health and safety



### TRANSPORT 4: USE REUSABLE OR RECYCLABLE SHIPPING MATERIALS

Most corrugated packaging is used commercially only once, whereas reusable containers made from more durable fiberboard or plastic can be reused about 50 times and 250 times, respectively, before they have to be replaced. While the initial cost of corrugated packaging is less than reusable alternatives, the repeated use of longer-lasting packaging leads to a lower cost per trip as well as reduced waste.

Users of reusable, standardized shipping containers have also reported improved asset utilization, reduced product damage and waste and improved handling safety and efficiency.<sup>16</sup>

Consider the following best practices to reduce the cost and waste generated by shipping containers and materials.

- **Switch to reusable shipping containers** instead of less durable materials like cardboard or plastic shrink wrap. Reusable containers generally work best in closed-loop distribution systems where containers can be efficiently returned to the point of origin. Containers that are collapsible (designed to fold down when empty), nestable (able to be placed inside each other) and stackable (designed to lock into each other for higher stacking heights) provide additional benefits.
- **Use longer-lasting and/or lighter recyclable plastic pallets or corrugated cardboard pallets** in place of wooden pallets; see sidebar.
- **Enrol in a pallet or container pooling service**, such as CHEP or the Canadian Pallet Council, where it is impractical to own reusable containers (e.g., in open-loop distribution systems).
- **Use reusable tie-down straps and bands** instead of shrink wrap or disposable strapping. The initial cost of a pallet strap will be recovered in the first five to fifteen uses.<sup>17</sup> Also, if plastic strapping is required, ensure it is made of plastic that can be recycled.
- **Use recycled cardboard and pallets** where cardboard must be used and recycle them again at the end of their useful lives.
- **Design packaging to be recycled** where reusable packaging or shipping containers are not feasible options.

### MORE RESOURCES

Canadian Pallet Council,  
[www.cpcpallet.com](http://www.cpcpallet.com)

CHEP, [www.chep.com](http://www.chep.com)

*Delivering the Goods: Benefits of Reusable Shipping Containers*, David Saphire, 1995, executive summary accessed at Inform,  
[www.informinc.org/xsum\\_deliver.php](http://www.informinc.org/xsum_deliver.php)

Greenlight Pallet Company  
[www.greenlightpallet.com](http://www.greenlightpallet.com)



## TRANSPORT 5: TRANSPORT HAZARDOUS MATERIALS SAFELY

Hazardous materials (hazmat) are transported every day by road, rail, air and ocean. Where the substitution of non-hazardous alternatives is not an option, safe transport of hazmat is essential. Improper transportation of hazmat can result in serious—even fatal—accidents; health and safety liabilities; business downtime; environmental contamination; and higher insurance premiums.

Consider the following best practices to ensure safe transport of hazmat by private or third party fleets.

- **Become knowledgeable of and compliant** with all hazmat transportation rules and regulations for all applicable modes. The sidebar provides a list of resources for more information.
- **Develop and implement a dangerous goods transportation security plan** that covers personnel security clearances and checks, package control procedures, security of loading/unloading areas, access control and emergency communications procedures.
- **Train employees** on safe hazmat handling, labelling, permitting and transportation regulations.
- **Use load planning software** that takes hazmat constraints into consideration and guards against inappropriate co-loading.
- **Inspect tanks or containers used to transport hazmat** regularly to detect and correct potential liquid or vapour leaks.

### LONDON DRUGS

#### Promoting safety through cautious hazardous materials procedure

To ensure the safety of warehouse and trucking staff, London Drugs follows strict procedures in the handling of used sharps (syringes) collected by its store pharmacies and returned to the DC for consolidation. Plastic containers with lids containing the syringes are put in thick plastic bags and placed in clearly labelled cardboard boxes, then placed on a pallet by themselves and shipped to the DC on a return truck. Upon their return, these boxes are carefully stored in a caged area for a short period until picked up by a professional company that handles contaminated goods.



Improved safety of handlers throughout supply chain



### MORE RESOURCES

Transport Canada, Transport Dangerous Goods Directorate,  
[www.tc.gc.ca/tdg/menu.htm](http://www.tc.gc.ca/tdg/menu.htm)

Transportation Safety Board,  
[www.tsb.gc.ca/](http://www.tsb.gc.ca/)

Dangerous Goods Advisory Council,  
[www.hmac.org](http://www.hmac.org)

Hazmat Management magazine,  
[www.hazmatmag.com](http://www.hazmatmag.com)



## 7 BEST PRACTICES IN SUSTAINABLE SCL: REVERSE LOGISTICS



### CATALYST PAPER

#### Taking back dunnage to benefit customers and the environment

Catalyst has initiated a dunnage return program, taking advantage of the closed-loop distribution system that returns Catalyst-owned rail containers from customers to its Surrey warehouse.

Formerly, customers had to figure out how to recycle or dispose of dunnage on their own. Now, Catalyst asks them to leave all of the cardboard, airbags and rubber mats used to protect products in transit and send it all back to Catalyst.

Back in Metro Vancouver, a contractor sorts the returned material and forwards reusable material back to Catalyst for reuse as dunnage or for alternative applications. The balance is currently recycled; however, the next phase of the project will examine whether Catalyst can use the non-reusable dunnage material as fiber in its paper production process.



Waste down: 14% of returned dunnage is reused and remainder is recycled



10% reduction in dunnage costs

Reverse logistics—the process of moving goods back from their final destination toward their point of origin for the purpose of capturing value or for reuse, recycling or for proper disposal—is a critical part of product lifecycle management.

In 1998, a U.S. study revealed that reverse logistics accounted for an estimated 4% of total logistics costs;<sup>18</sup> however, reverse logistics should be considered not a cost, but an opportunity. Reverse logistics can enhance customer satisfaction, increase brand value, provide revenue opportunities from reconditioned or recycled products and reduce costs of goods sold by reusing parts or materials from returned items. Companies can also market product or packaging take-back programs as value-added solutions for their customers.

Sustainable reverse logistics practices are as follows.

**Reverse Logistics 1:** Optimize efficiency of product returns

**Reverse Logistics 2:** Implement high-value, low-waste disposition strategies

## REVERSE LOGISTICS 1: OPTIMIZE THE EFFICIENCY OF PRODUCT RETURNS

Product returns can be the result of damage in transit or during use, the end of a lease or a rental period, the expiration of seasonal merchandise, restock programs, product recalls or excess inventory. For producers of time-based, seasonal or fashion-oriented products, product returns can be very high, making the efficient handling of the reverse logistics process a competitive necessity. Even for companies where returns are more exceptions than the rule, the cost to handle returns is often disproportionately high to the amount of returns.

In addition to customer-initiated product returns, trends toward increased extended producer responsibility and product stewardship regulation also necessitate more efficient reverse logistics processes.

Consider the following best practices to optimize the efficiency of the product returns process and minimize related logistics costs, emissions and product waste.

- **Design products and packaging** to facilitate safe, efficient and cost-effective recovery and disassembly for reuse or recycling.
- **Implement a proactive take-back program** to reclaim products at the end of their useful lives.



### LONDON DRUGS

#### Optimizing reverse logistics

Making use of a closed loop truck delivery system between its DC and stores, London Drugs centralizes recyclables, such as pop cans and film cases and customer returns, such as appliances and electronics, allowing efficient handling of returned goods and disposition of recyclables.

The company makes use of a 10,000 square foot mezzanine area in its DC to sort, examine and process defective items returned from stores. LD has streamlined procedures to send defective electrical items to vendor-identified repair depots. Vendors will credit LD, refurbish or replace products and return them to LD, or recycle the used parts effectively.

Reclamation of defective goods has been made easier through the use of a computerized barcoding system that tracks store and item particulars on returned products. This information helps to reduce errors and speed up related accounting practices.



Reduced waste from reclaimable items



Reduced cost of returns processing



Increased value realized from goods reclamation

### DID YOU KNOW

BC's product stewardship programs currently regulates beverage containers; lead-acid batteries; lubricating oil, filters and containers; medications; paints; tires; and solvents and flammable liquids, gasoline, electronic waste and pesticides.

BC Ministry of Environment, Environmental Management Branch, Product Stewardship Program,  
[www.env.gov.bc.ca/epd/epdpa/ips](http://www.env.gov.bc.ca/epd/epdpa/ips)



## MORE RESOURCES

Reverse Logistics Executive Council, [www.rlec.org](http://www.rlec.org), especially the publication *Going Backwards: Reverse Logistics Practices and Trends*

Recycling Council of BC, [www.rcbc.bc.ca](http://www.rcbc.bc.ca)

“The Hidden Value of Reverse Logistics”, Diane A. Mollenkopf and David J. Closs, *Supply Chain Management Review*, July 1, 2005, accessed at [www.scmr.com/article/CA624966o.html](http://www.scmr.com/article/CA624966o.html)

BC Ministry of Environment, Environmental Management Branch, Product Stewardship Program, [www.env.gov.bc.ca/epd/epdpa/ips](http://www.env.gov.bc.ca/epd/epdpa/ips)

Environment Canada Extended Producer Responsibility & Stewardship, [www.ec.gc.ca/epr/default.asp?lang=En&n=EEBCC813-1](http://www.ec.gc.ca/epr/default.asp?lang=En&n=EEBCC813-1)

Product Stewardship Institute, <http://www.productstewardship.us/>

European Union Integrated Product Policy, <http://ec.europa.eu/environment/ipp/>

## DID YOU KNOW

**Reconditioning** includes repair, refurbishing and remanufacturing, with repair involving the least amount of effort and remanufacturing involving the greatest.

**Cannibalization** is the recovery of reusable parts from used products.

**Recycling** is the reuse of materials for another product/s.

**Primary recycling** returns the product back to its original application.

**Secondary recycling** returns it to a lower-grade application.

**Tertiary recycling** decomposes the product into its raw materials for recycling.

*Going Backwards: Reverse Logistics Practices and Trends*, Reverse Logistics Executive Council, [www.rlec.org](http://www.rlec.org)

- **Build business rules into the returns process** and track information with products so the reason for return and the disposition status of the product is clear. Clear information can reduce the disposition turnaround time, decrease handling and administrative costs and reduce waste.
- **Implement a centralized return centre (CRC)** devoted to sorting, processing and shipping returned products to their next destinations. A CRC can increase the value realized from returned items; reduce waste; reduce transportation costs and environmental impacts; and increase visibility of quality problems that should be corrected.
- **Outsource reverse logistics to a third party.** Third parties can generate economies of scale that individual manufacturers or retailers often cannot, thereby increasing the realized value of returned products and reducing the amount of waste that would otherwise result.



## REVERSE LOGISTICS 2: IMPLEMENT HIGH-VALUE, LOW-WASTE DISPOSITION STRATEGIES

Product lifecycle management strategies that realize the value remaining in returned products are gaining ground, as are strategies to avoid waste and environmental or social harm caused by unnecessary, premature, or unsafe disposal of products.

Consider the following best practices to maximize the value realized from and waste produced by, returned products and packaging.

- **Assess value of returned products and determine resale, reuse, or recycling potential** of the whole product as distinct from the potential value of individual modules, components, or materials.
- **Recondition, cannibalize and recycle** returned products to recover value and reduce waste.
- **Disassemble and reclaim any recyclable materials and safely dispose of the remainder** where reconditioning is not possible because of product condition, legal, or environmental restrictions. These strategies—whether performed in-house or by another party—are aimed at recovering value from returned products and reducing waste that would result from immediate disposal in a landfill.
- **Donate serviceable returned products to charitable organizations** for redistribution to those in need.



## 8 SUGGESTED ACTIONS TO GET STARTED ON SUSTAINABLE SCL

As seen in the previous sections, considering sustainability objectives along with traditional drivers of supply chain value offers another way for companies to look at their SCL practices and opens up the opportunity to realize new financial benefits along with environmental and social gains. But where to start? How do you begin to consider sustainability objectives more explicitly in your SCL practices and decision-making?

Among the best practices presented in this Guide are a number of opportunities for quick success. For example:

- Increasing the level of communication and collaboration between internal departments and with customers and suppliers will undoubtedly lead to improved forecast accuracy and more informed choices that result in improved SCL efficiencies and less waste.
- Instituting the practice of turning off lights and HVAC systems when they are not needed in a warehouse facility will reduce energy consumption and lower utility bills.
- Eliminating unnecessary idling of delivery vehicles will yield immediate benefits in reduced fuel costs and air emissions.

These types of practices likely do not need formal project status or formal executive support to implement. But beyond these and other quick successes are substantial improvement opportunities that likely will require a more systematic approach to realize the available benefits. This section outlines potential barriers and solutions, critical success factors and suggested approaches for mounting sustainable SCL improvement initiatives to achieve real financial and sustainability benefits.

## BARRIERS TO SUSTAINABLE SCL IMPLEMENTATION

Common internal and external barriers to change and suggestions to overcome them include:

**Perception of higher costs and uncertain payback.** There can be internal resistance to moving forward on sustainable SCL initiatives based on the commonly-held perception that they always involve unjustifiable higher costs. One of the most effective ways to address this barrier is to tap into the growing body of success stories that indicate otherwise. Seek and communicate examples that are most relevant to your organization's sector, size, operational characteristics and regulatory context.

**Sustainability performance is not important to customers, especially if there is a cost premium.** The fact is, more and more private sector organizations are adopting corporate responsibility policies and practices, including consideration of the social and environmental impacts of their purchasing decisions. Keep an eye on these trends. Also, look for the early sustainable SCL 'wins' that offer a compelling price/value combination to your customers.

**Lack of internal resources, expertise and senior executive support.** Sustainability initiatives often originate with a single motivated employee working off the 'side of their desk'. It is important for this individual to seek out other champions particularly those key decision-makers that, armed with a strong business case, can help build executive support for sustainable SCL initiatives and catalyze allocation of requisite resources. In addition, a broad array of external, mostly internet-based resources – some listed in this Guide – are available at low or no cost, providing access to strategies, case studies and incentive programs. As sustainability is increasingly being incorporated in post-secondary educational curricula across multiple disciplines, it also may be helpful to seek such expertise when recruiting new employees.

**Internal resistance to change.** Transformation to sustainable SCL practices can face internal resistance, if only because the compelling external drivers for change are not evident. One way to address this is to monitor and raise internal awareness of competitors' activities to advance sustainable SCL, as well as other drivers of change, such as increasingly stringent restrictions on hazardous substances, or the likelihood of higher energy costs. Ensuring sustainability goals are included as appropriate in job descriptions also motivates employee engagement and action.

### DID YOU KNOW

A survey of supply chain professionals revealed the top ten success factors for supply chain initiatives at their companies:

- Visible and active senior executive commitment to outcomes.
- Performance measures aligned to desired outcomes.
- Awareness of need to substantially reduce inventories.
- Project management clearly established and executed.
- Technology enablers established and operating.
- Collaboration with supply chain partner(s).
- Awareness of need to increase customer satisfaction ratings.
- High goals set at outset.
- Realistic business case established to track results.
- Trust between workers and senior management.

“A Survey of Supply Chain Progress”, *Supply Chain Management Review*, Charles C. Poirier and Francis J. Quinn, September 1, 2003

### CRITICAL SUCCESS FACTORS FOR IMPLEMENTING SUSTAINABLE SCL

The factors that determine the success of a sustainable SCL initiative are much the same as those for any SCL initiative (see the sidebar).

Six elements commonly figure in successful sustainable SCL initiatives. They are:

1. An engaged cross-functional sustainable SCL team, supported by senior management.
2. Sustainable SCL objectives defined and aligned with corporate objectives.
3. Identified priorities for improvement, with initial focus on achieving 'early wins' to establish credibility
4. A strong business case for sustainable SCL initiatives.
5. Supportive corporate sustainability policy.
6. A commitment to implementation, measurement, and continuous improvement.

Achieving these success factors is not linear, but iterative. For example, building executive support will be aided by demonstrable early successes and supported by a business case that is aligned with corporate objectives.

### TIPS FOR ACHIEVING THE CRITICAL SUCCESS FACTORS

#### 1. An engaged cross-functional sustainable SCL team, supported by senior management

Sustainable SCL practices cut across functional lines; indeed, the essence of supply chain management is to break down internal and external silos and operate in an integrated manner. Identifying and implementing sustainable SCL practices might involve people from logistics, purchasing, EHS (environment, health and safety), operations, marketing and sales, finance and quality or risk management.

The following tips will help guide you to compose an effective cross-functional team and build executive support.

- **Measure and promote early successes** to establish credibility and attract executive attention.
- **Identify a manager** who is respected across the organization, has decision-making authority, is willing to break down barriers and will be accountable for the success of the initiative.



### MORE RESOURCES

*Forging New Links, Enhancing Supply Chain Value through Environmental Excellence*, by the Global Environmental Management Initiative, provides a useful chart that shows typical cross-functional roles in various kinds of sustainable supply chain initiatives. The guide is available at [www.gemi.org/supplychain](http://www.gemi.org/supplychain).

- **Identify a day-to-day project champion/manager** to drive the process forward and to act as the main go-to person for questions and concerns.
- **Create a cross-functional team** comprised of members who are knowledgeable about the processes in their area, are respected in the organization, are able to influence decision-makers, are willing to break down barriers, are good team players and are good communicators who can become grass-roots champions of the initiatives identified.
- **Focus the cross-functional team on common objectives and areas of mutual interest and benefit.** This will help to break down functional silos where sales “owns” the customer, EHS (environmental, health and safety) “owns” sustainability, logistics “owns” physical distribution, purchasing “owns” the supplier, etc. and where no one has the incentive to initiate innovations in sustainable logistics.

## 2. Sustainable SCL objectives defined and aligned with corporate objectives.

Aligning any supply chain initiative with an organization’s strategic objectives sets the context for the initiative; it helps to communicate the “why”—that is, why the initiative makes sense and is strategically important. This is no less the case with sustainable SCL initiatives.

The following tips will help to guide you to determine the objectives of sustainable SCL and align them with your corporate objectives.

- **Spend time up front determining the role of sustainability in your business.** Best practices in implementing “green supply chains” presented at the 2005 Supply Chain World Conference and Exposition recommended that organizations spend time asking if sustainability is driven by:
  - Product differentiation?
  - Competitive necessity?
  - Cost reduction?
  - Risk management?
  - Desire to redefine markets?
  - Establish stakeholder support?
  - Meet environmental indicators within corporate reporting?

Creating clear linkages between sustainable logistics management objectives and an organization’s corporate objectives provides a stronger foundation than when the linkages are unclear or simply not there.

### LONDON DRUGS

#### Involving staff in process reengineering

When London Drugs needed to address storage space requirements and process flow for its product returns, employees on the floor were involved from the planning phase.

A management team asked workers which parts of the process were functioning well and which parts were not. The process redesign team found that, not only did most good suggestions come from workers, but also that employee involvement in the design process results in more positive participation in the eventual changes.

The result? DC returns staff like the new streamlined workstations and process flow and find that they can easily get more work done than they used to in the same amount of time.



Improved employee morale and productivity



Reduced costs due to process efficiencies



More effective product returns function

### DID YOU KNOW

If there are existing sustainability initiatives in the company, promote them throughout the organization to reinforce and strengthen positive attitudes about sustainability. Work towards a sustainable company identity.

## CATALYST PAPER

### Working with customers to remove barriers to freight efficiency

Catalyst is being proactive in educating its customers and the final end-users of its newsprint and specialty paper to become more freight efficient.

Where the company formerly accepted orders of any quantity, no questions asked, customer relationship managers are now trained to talk to customers about the logistics and cost implications of their choices.

For example, a customer who orders 60 paper rolls when 50 will fit in a rail container is offered the opportunity to revise the order and benefit from the improved freight efficiency of a 50-roll order.

By working with its customers—who are some of North America’s biggest pressrooms—Catalyst is achieving financial and sustainability benefits and enhancing its relationships with customers.



Enhanced customer service and satisfaction



Lower logistics costs through improved efficiencies



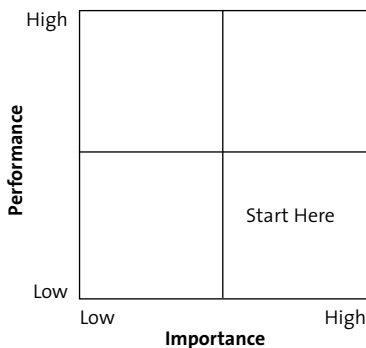
Reduced fuel consumption and emissions



Reduced traffic congestion

## DID YOU KNOW

Refer to Section 3 to map performance assessment scores in the matrix below. This will help you prioritize sustainable SCL opportunities.



- **Demonstrate how sustainability goals can add value to SCL practices**, rather than how SCL practices can meet sustainability goals.
- **Use mainstream language** that will be understood as opposed to environmental or supply chain jargon.
- **Link sustainable logistics objectives to existing process improvement projects**, quality initiatives, or corporate responsibility programs that the company has already committed to.

### 3. Identified priorities for improvement, with initial focus on achieving 'early wins' to establish credibility

Identifying and selecting sustainable SCL opportunities involves analyzing the current state and envisioning what the future could look like if changes were made.

Identifying opportunities can be approached from several perspectives; you could diagnose your risk areas, logistics process inefficiencies, customer expectations, areas of greatest environmental and/or social footprint, or emerging regulatory or industry issues that will affect the way you operate. Looking at your business from any of these angles will help to spotlight improvement opportunities

Tips to help you identify improvement opportunities are as follows:

- **Review your performance assessment in Section 3** of this Guide. Map your scores on a matrix such as the one in the sidebar. Start with the areas that fall in the lower right-hand “low performance” / “high importance” quadrant to prioritize sustainable SCL improvement opportunities at your company.
- **Ask your customers about their sustainability performance expectations.** A common misperception is that customers don’t care about sustainability; however, educating them on the implications of their choices on SCL efficiencies can lead to decisions that use less fuel, consume less energy, or result in less waste. Furthermore, promoting sustainable logistics innovations can result in positive brand recognition and competitive advantage.
- **Brainstorm with the cross-functional team** to reveal issues and opportunities to improve.
- **Engage staff** in identifying areas for improvement/potential solutions.
- **Use lifecycle costing approaches** to allocate environmental and social costs to responsible products throughout their lifecycles and identify the true costs of environmental, health and safety impacts, which are often hidden in “overhead” or neglected after a product is manufactured.

- If you outsource part or all of your SCL already, **measure the cost of 3PL sustainability performance issues** for your company. Are you paying for excess fuel consumption, excess energy consumption, excess waste, or inefficient processes? Take more control over the choice and management of your 3PL as you would any supplier that is, in effect, an extension of your brand. Your suppliers' environmental and social impacts contribute to your company's own lifecycle impacts.

Once you have identified sustainable SCL improvement opportunities, the following tips can help you select which opportunities to pursue.

- **Organize improvement opportunities** and link them to the objectives defined in the previous action step.
- **Prioritize opportunities** using criteria such as alignment with sustainability and corporate objectives, project feasibility, financial and non-financial benefits and the ability of your organization to execute the project. Choosing to pursue a small number of opportunities with high chances of success is more advisable than trying to conquer all opportunities at once.
- **Document the opportunities** to ensure you are clear about what you want to do and why. If you are unable to articulate the opportunities, you need to return to earlier action steps until you can.

#### 4. A strong business case for sustainable SCL initiatives

Once you have selected improvement opportunities, develop a business case that documents the costs and benefits as well as the project risks, including the risks of maintaining the status quo.

Tips to help you develop the business case are as follows.

- **Build a business case to implement a small pilot initiative** that demonstrates measurable, quantifiable business benefits and take advantage of the momentum of these early successes to achieve more substantial improvements.
- **Link the benefits of sustainable logistics initiatives** with traditional supply chain value drivers: increased revenue, reduced costs, improved asset utilization and increased customer service levels. Always coming back to these will provide context for how sustainability can drive business value.
- **Look beyond your company's four walls** when assessing the value created by sustainable logistics. The business case for some initiatives may be strengthened by benefits that could be shared with customers or suppliers.

#### MORE RESOURCES

GEMI (Global Environmental Management Initiative) has developed a number of resources to help companies evaluate their sustainability performance, integrate sustainability into their business processes and formulate business cases. Tools can be found at [www.gemi.org/supplychain](http://www.gemi.org/supplychain).

The New Zealand Council for Sustainable Development's *Business Guide to a Sustainable Supply Chain—A Practical Guide* and online self-diagnostic tools are available at [www.nzbcscd.org.nz/supplychain](http://www.nzbcscd.org.nz/supplychain).

The U.S. Environmental Protection Agency's guide, *The Lean and Green Supply Chain: A Practical Guide for Materials Managers and Supply Chain Managers to Reduce Costs and Improve Environmental Performance*, includes useful templates for diagnosing issues and opportunities, as well as detailed examples for quantifying benefits. [www.epa.gov/oppt/library/pubs/archive/acct-archive/pubs/lean.pdf](http://www.epa.gov/oppt/library/pubs/archive/acct-archive/pubs/lean.pdf)



## PUROLATOR

### Aiming high and proving the concept

When implementing hybrid-electric vehicles in its in-city delivery fleet, Purolator's project team faced some doubters. The team conquered the challenge of change by communicating, communicating, communicating and by proving that the concept would work.

Several presentations to upper management and to drivers started the process; but it was the opportunity to drive the HEV that really solidified the support for change. After drivers tested the vehicles in real-life routes, they were supportive.

In addition, Purolator tagged the HEV business case to the company's ultimate goal to completely redesign the delivery vehicle. By positioning the HEV as a component of the company's long-term competitive strategy rather than as a quick fix, the project team gained senior management support.

## UPS

### Tracking and reporting on KPIs of sustainable supply chain logistics

UPS issued its first annual Corporate Sustainability Report in October, 2003. Some of the key performance indicators (KPIs) included in the report are:

- Fuel efficiency: Gallons of ground fuel consumed per package delivered
- Energy efficiency: Gigajoules of energy consumed per package delivered and per \$1,000 of revenue
- Emissions: Metric tons of CO<sub>2</sub> emitted per 1,000 packages delivered and per \$1,000 of revenue
- Waste: Percentage of total waste recycled, incinerated, or treated and landfilled
- Environmental management: Percentage of environmental agency inspections that result in penalties
- Health and safety: Number of reportable spill incidents, with a "zero spill" objective

[sustainability.ups.com/](http://sustainability.ups.com/)

- **Do a full financial cost-benefit analysis** to counteract assumptions that sustainability is a net cost. There can also be significant benefits. Moreover, financial incentives from governments to undertake initiatives with sustainability benefits, such as special tax credits, can add to the business case.

### 5. Supportive corporate sustainability policy

A formal corporate commitment to sustainability in the form of, for example, a Corporate Social Responsibility Policy provides direction to employees and conveys organizational values and accountabilities for results. The policy also serves to inform external parties, including customers, suppliers and regulatory agencies.

### 6. A commitment to implementation, measurement and continuous improvement.

Once you have received approval of the business case and have secured necessary resources, you will need to develop a thorough project plan, marshal resources and implement for success!

Tips to implement and measure are as follows.

- **Develop a project plan** including tasks, milestones and deliverables.
- **Establish the cross-functional team** who will be responsible for implementation. These may or may not be the same people who were involved in evaluating and selecting opportunities.
- **Establish measurable key performance indicators (KPIs)** of the environmental, financial and social performance of your SCL activities to track the results of the project. Each company should select KPIs that reflect their specific business operations; the sidebar example from UPS provides some ideas. Additional guidance on the development of KPIs is provided in the section below.
- **Pilot and demonstrate the results** throughout the organization. People understand and are more supportive of what they can touch and feel. In essence, involve the people who will be impacted by the decision as well as those whose support will be essential to success.
- After making any necessary adjustments, **roll out the implementation**.
- **Measure results** using the defined key performance indicators and iterative self-assessments per Section 9 promote and celebrate your successes.
- **Repeat the above process**, with a commitment to continuous improvement.

## INDUSTRY STANDARDS AND BENCHMARKS

**Benchmarking** is the process of comparing one's business processes and performance metrics to industry bests and/or best practices from other industries. Dimensions typically measured are quality, time and cost. In the process of benchmarking, management identifies the best firms in their industry, or in another industry where similar processes exist, and compare the results and processes of those studied (the "targets") to one's own results and processes. In this way, they learn how well the targets perform and, more importantly, the business processes that explain why these firms are successful.

Also referred to as "best practice benchmarking" or "process benchmarking", this process is used in management and particularly strategic management, in which organizations evaluate various aspects of their processes in relation to best practice companies' processes, usually within a peer group defined for the purposes of comparison. This then allows organizations to develop plans on how to make improvements or adapt specific best practices, usually with the aim of increasing some aspect of performance. Benchmarking may be a one-off event, but is often treated as a continuous process in which organizations continually seek to improve their practices.

Benchmarking is a way to compare your organizations' performance to that of others in your sector as well as other sectors as appropriate.

Fifteen percent of sustainability executives say their goals were significantly influenced by the goals of competitors. Learn about what your peers are doing to advance sustainable SCL initiatives as an alternative to "reinventing the wheel". Topics for comparison may include:

- Whether and how environmental, human rights, and ethical considerations are integrated into decision-making
- Energy use and emissions per unit of goods manufactured and/or transported
- Compliance with international industry standards
- Reporting practices

There are several general and industry-specific standards to choose from. Here are a few examples of international sustainability-related standards:

LEED, the Leadership in Energy and Environmental Design Green Building Rating System, [www.cagbc.org](http://www.cagbc.org)



## MORE RESOURCES

IndEco *Calculating Eco-efficiency Indicators: Workbook for Industry*

[www.indeco.com/www.nsf/papers/ee\\_wkbk](http://www.indeco.com/www.nsf/papers/ee_wkbk)

The Carbon Disclosure Project,

<https://www.cdproject.net/en-US/Pages/HomePage.aspx>

Sustainability and Rating Agencies

There are a number of rating agencies that conduct analysis of company practices using a standard set of questions. Examples of these companies include Delphi, IW Financial, Trucost and Vigeo.

Certification Standards. A global directory of ecolabel certification standards can be accessed at

[www.ecolabelindex.com](http://www.ecolabelindex.com)

Financial Benchmarking in the Shipping Industry

[http://www.pwc.com/en\\_GR/gr/surveys/assets/shipping-benchmarking-survey-2010.pdf](http://www.pwc.com/en_GR/gr/surveys/assets/shipping-benchmarking-survey-2010.pdf)

ISO 14000, a series of standards that address various issues such as environmental management, labeling, performance evaluation, life cycle analysis, communication and auditing

[www.iso.org/iso/iso\\_14000\\_essentials](http://www.iso.org/iso/iso_14000_essentials)

ISO 26000, guidance on social responsibility and is not a management system standard, [www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=42546](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=42546)

Traditionally benchmarks have focused on time, cost and quality aspects. Examples of sustainability-related topics that can form a basis for benchmarking include the following:

### OPERATIONS

- Reduction in fossil fuel consumption
- Reduction in air emissions (e.g. greenhouse gases)
- Water and energy use per unit of production
- Fleet accident rate

### PRODUCT AND PACKAGING

- Total amount of packaging reduced
- Reduction of hazardous materials
- Amount of waste reduced per unit of product
- Amount of post-consumer/recycled materials used

### RECYCLING AND REUSE

- Percent recycled content
- Percentage of products included in a manufacturer take-back program

### SUSTAINABLE SOURCING

- Percentage of products sourced locally
- Percentage of sourced products that meet or exceed a certification standard or standards

See the Additional Resources section for calculators to measure some of these.



## 9 MEASURING SUCCESS AND CONTINUOUS IMPROVEMENT

Measuring progress towards sustainable SCL goes hand in hand with management decision-making. Identifying key performance indicators and using them over time enables your organization to identify where progress is being made and where additional effort is needed. They also support external reporting that may be required by regulators, shareholders and other stakeholders.



## KEY PERFORMANCE INDICATORS- TIPS AND TEMPLATES

Key performance indicators (KPIs) are an important means of measuring and reporting on the activities, outcomes and benefits of sustainable SCL practices. Performance indicators are specific pieces of information that can be used to measure the performance of an organization, business or other entity across a variety of different thematic areas (e.g. cost savings; increased energy efficiency, solid waste diverted from landfill; reduced air emissions).

### Be Strategic in Selecting KPIs

Typically there are many potential KPIs to measure advancement of sustainable SCL practices. Rather than trying to measure all aspects of your operation, a strategic and practical approach is recommended to establish a manageable set of KPIs. The following table provides suggested criteria and actions.

KPI Selection Criteria	Suggested Actions to Confirm/Apply
<p><b>Relevant</b> – The KPIs are directly relevant to the values, interests and objectives of your organization and its key audiences.</p>	<p>Check KPIs for relevance to internal policies, strategic plans, business plans, and other relevant documents</p> <p>Complete the self-assessment checklist in Section 3 of this Guide, which will help to establish a relative ranking of importance of different themes (e.g. cost savings; increased energy efficiency, solid waste diverted from landfill; reduced air emissions) and associated actions</p> <p>Check with key internal and external audiences</p> <p>Evaluate KPIs on a regular basis to provide a feedback loop and help ensure continuous improvement. For example, different priorities may emerge over time, influencing the relevancy of different KPIs.</p>
<p><b>Understandable</b> – The KPIs are easily understood by relevant internal and external audiences, including non-technical audiences</p>	<p>Check with key internal and external audiences</p>
<p><b>Available</b> – The data for the KPIs are available and accessible, or can be readily developed by your organization in a cost effective manner</p>	<p>Identify and check with internal and external data providers; confirm costs for data acquisition. Confirm data availability over time.</p>
<p><b>Credible</b> – The KPIs are supported by valid, reliable information and are analyzed or interpreted in a defensible manner</p>	<p>Confirm credibility with external audiences.</p>
<p><b>Temporal</b> – The data for the KPIs can be updated regularly to help identify trends</p>	<p>Confirm update frequency requirements and confirm feasibility and costs with external and/or internal data providers.</p>
<p><b>Integrative</b> – The KPIs demonstrate connections among key dimensions of sustainability</p>	<p>Confirm financial, social and environmental connections with external and/or internal experts.</p>

### Continuous Improvement

Benchmarks, standards and targets are useful tools with which to track progress towards a certain goal or desired outcome for a given set of measures. They are particularly useful in terms of putting KPI data into context and making the data more meaningful, relevant and understandable. The simplest approach for their use is to establish a baseline (e.g. current performance) and then measure progress against the baseline. Depending on the specific aspects of your organization, there may be relevant regulatory and/or voluntary standards to achieve (e.g. 100% compliance with hazardous materials shipping and storage regulations; follow LEED criteria in building design). You can also set your own targets in relation to policy goals and objectives (e.g. 25% reduction in solid waste; 25% increase in fuel/energy efficiency).

As noted above, depending on your sector, benchmarks, standards and targets can help guide what aspects of sustainable SCL performance can be measured.

Standards and targets can be particularly useful in linking performance (via indicator data and trends) with specific policies and decisions, thus making them more relevant and specific to the departments for these policies and decisions. For example, if KPI data showed a trend that is moving away from an existing standard or target, it may be easier to get the attention of those responsible for achieving the target, than it would be if there was no policy target and no measurement framework in place.

The following pages provide examples of templates you can use to record output and outcome indicators by theme and record KPI data. Themes and the kinds of data recorded are provided for illustrative purposes; you will want to select those that apply specifically to your operation and sector.



## KEY PERFORMANCE INDICATORS - TEMPLATE EXAMPLES OF OUTPUT AND OUTCOME INDICATORS

Reporting Theme	OUTPUT Indicators	OUTCOME indicators
<b>Insert Theme Here</b>	Undertook analysis / audit / inventory on the baseline conditions (i.e. current situation)  Implemented policies, plans, programs, strategies and other initiatives to improve the baseline conditions	State of ... (Insert Theme Here)  Change in State of ...
<b>Climate Change</b>	Conducted GHG emissions audit / inventory  Implemented GHG reduction policies, plans, programs, and strategies  Developed climate change adaptation plan / strategy	Greenhouse gas emissions (total, % change, per economic output, per capita)  Community / organizational resilience to climate-related incidents such as flooding, drought, forest fires
<b>Energy</b>	Conducted energy audit / inventory  Implemented energy conservation and efficiency programs and technologies	Energy consumption (total, % change, per economic output, per capita)
<b>Solid Waste Management</b>	Conducted solid waste audit / inventory  Implemented waste reduction, reuse and/or recycling programs	Solid waste disposal and/or diversion from disposal (total, % change, per economic output, per capita)  Proportion of total waste stream by type of waste management (% recycling, reuse, composting, landfill, etc.)
<b>Transportation</b>	Conducted fleet audit / inventory  Implemented practices and technologies to improve fleet fuel efficiency and reduce air emissions	Ambient air quality  Estimate of vehicle fleet air emissions
<b>Water and Wastewater</b>	Conducted water and wastewater audit / inventory  Implemented water conservation, reuse and/or recycling programs  Implemented practices and technologies to improve pollution source controls and wastewater reduction	Water consumption  Wastewater quality analysis

Note: The example themes and indicators above have been selected to illustrate examples of both output and outcome indicators as well as the interconnections between these indicators in measuring performance. They have been selected because of their relation with a wide variety of organizations and industries and have not been screened specifically in relation to supply chain logistics.

## KEY PERFORMANCE INDICATORS - TEMPLATE EXAMPLE OF KPI DATA REPORTING SYSTEM

Theme: Solid Waste Management

<b>OUTPUT INDICATORS</b>			
<b>Key Performance Indicator (units): Staff Training in Solid Waste Management Policies &amp; Practices (# of staff trained)</b>			
<b>Timeline</b>	<b>Date</b>	<b>Absolute Value</b>	<b>Percentage Change (% since baseline)</b>
Baseline Period	December 31, 2011	2	0.0%
1st quarter	March 31, 2011	5	150.0%
2nd quarter	June 30, 2011	10	400.0%
3rd quarter	September 30, 2011	10	400.0%
4th quarter	December 30, 2011	10	400.0%

Notes:

Employee Responsible for Reporting: Manager, Solid Waste

Data Source: Company Records (training records, monthly invoicing from waste management contractor)

Frequency of Reporting: Quarterly

<b>OUTCOME INDICATORS</b>			
<b>Key Performance Indicator: Solid Waste Disposal (metric tonnes of solid waste disposed of)</b>			
<b>Timeline</b>	<b>Date</b>	<b>Absolute Value</b>	<b>Percentage Change (% since baseline)</b>
Baseline Period	December 1, 2010	1000	N/A
Period 1	December 1, 2011	900	-10.0%
Period 2	December 1, 2012	-	-
Period 3	December 1, 2013	-	-

<b>Key Performance Indicator: Diversion of Solid Waste from Disposal (metric tonnes of solid waste disposed of)</b>			
<b>Timeline</b>	<b>Date</b>	<b>Absolute Value</b>	<b>Percentage Change (% since baseline)</b>
Baseline Period	January 1, 2011	100	N/A
1st quarter	March 31, 2011	200	100.0%
2nd quarter	June 30, 2011	-	-
3rd quarter	September 30, 2011	-	-
4th quarter	December 30, 2011	-	-

# 10 ADDITIONAL RESOURCES

## RESOURCES USED IN THE DEVELOPMENT OF THIS GUIDE

### METRO VANCOUVER

SmartSteps™ guides, <http://www.metrovancouver.org/smartsteps/bestpractices/Pages/SectorGuides.aspx>,

especially *Warehousing/Wholesaling, Transportation and Sustainable Purchasing*

BuildSmart, <http://www.metrovancouver.org/buildsmart/Pages/default.aspx>

### CANADIAN FEDERAL OR PROVINCIAL GOVERNMENT

BC Ministry of Energy, Mines and Petroleum Resources, *Energy Efficient Buildings: A Plan for BC*

BC Ministry of Environment, [www.gov.bc.ca/env](http://www.gov.bc.ca/env)

Environment Canada, especially the *Environmental Life Cycle Management: A Guide for Better Business Decisions*

[www.ec.gc.ca/p2/default.asp?lang=En&n=BAEAB4C6-1](http://www.ec.gc.ca/p2/default.asp?lang=En&n=BAEAB4C6-1)

Environment Canada Extended Producer Responsibility & Stewardship, [www.ec.gc.ca/epr/default.asp?lang=En&n=EEBCC813-1](http://www.ec.gc.ca/epr/default.asp?lang=En&n=EEBCC813-1)

Industry Canada, logistics industry profile, [www.ic.gc.ca/eic/site/dsib-logi.nsf/eng/home](http://www.ic.gc.ca/eic/site/dsib-logi.nsf/eng/home)

National Research Council *Design for Environment* guide and eco-efficiency, [www.ic.gc.ca/eic/site/ee-ee.nsf/eng/Home](http://www.ic.gc.ca/eic/site/ee-ee.nsf/eng/Home)

Natural Resources Canada Office of Energy Efficiency, <http://oe.nrcan.gc.ca/>

Transport Canada, especially the Freight Efficiency Program, <http://www.tc.gc.ca/eng/mediaroom/releases-nat-2004-04-ho19e-3972.htm>

and the Dangerous Goods Directorate, [www.tc.gc.ca/tdg/menu.htm](http://www.tc.gc.ca/tdg/menu.htm)

Transportation Safety Board, [www.tsb.gc.ca](http://www.tsb.gc.ca)

### U.S. AND INTERNATIONAL GOVERNMENT

European Union Integrated Product Policy, [ec.europa.eu/environment/ipp/](http://ec.europa.eu/environment/ipp/)

U.S. Environmental Protection Agency, especially the publication *The Lean and Green Supply Chain*,

[www.epa.gov/oppt/library/pubs/archive/acct-archive/pubs/lean.pdf](http://www.epa.gov/oppt/library/pubs/archive/acct-archive/pubs/lean.pdf)

### ASSOCIATIONS AND NON-GOVERNMENTAL ORGANIZATIONS

BioFleet, [www.biofleet.net](http://www.biofleet.net)

Buildinggreen.com, [www.buildinggreen.com](http://www.buildinggreen.com)

Building Owners and Managers Association of BC (BOMA), Go-Green program, [www.boma.bc.ca/gogreen.php](http://www.boma.bc.ca/gogreen.php)

Business for Social Responsibility, [www.bsr.org](http://www.bsr.org), especially the report *Suppliers' Perspectives on Greening the Supply Chain*

and the Clean Cargo Working Group resources

Canada Green Building Council, [www.cagbc.org](http://www.cagbc.org)

Canadian Business for Social Responsibility, [www.cbsr.ca](http://www.cbsr.ca)

Canadian Pallet Council, [www.cpcpallet.com](http://www.cpcpallet.com)

Canadian Standards Association, [www.csa.ca/standards/environment](http://www.csa.ca/standards/environment)

Centre for Sustainable Transportation, especially the *Sustainable Transportation Monitor* publications, [cst.uwinnipeg.ca/monitor.html](http://cst.uwinnipeg.ca/monitor.html)

Clean Air Corridor Demonstration Project [www.tc.gc.ca/eng/programs/environment-ecofreight-road-tools-casestudies-enbridge-552.htm](http://www.tc.gc.ca/eng/programs/environment-ecofreight-road-tools-casestudies-enbridge-552.htm)

Council of Supply Chain Management Professionals, [www.cscmp.org](http://www.cscmp.org)

Dangerous Goods Advisory Council, [www.hmac.org](http://www.hmac.org)

Fleet Challenge Canada, [www.fleetchallenge.ca](http://www.fleetchallenge.ca)

Fraser Basin Council, [www.fraserbasin.bc.ca](http://www.fraserbasin.bc.ca)

Fuel Cells Canada, [www.fuelcellscanada.ca](http://www.fuelcellscanada.ca)

Global Environmental Management Initiative (GEMI) Forging New Links, [www.gemi.org/supplychain](http://www.gemi.org/supplychain)

International Standards Organization (ISO), [www.iso.org](http://www.iso.org)

MIT Center for Transportation Logistics, especially the publication *The Supply Chain Response to Environmental Pressures Discussion Paper*, Julie Paquette, available at [www.mendeley.com/research/supply-chain-response-environmental-pressures-discussion-paper/](http://www.mendeley.com/research/supply-chain-response-environmental-pressures-discussion-paper/)

New Zealand Business Council for Sustainable Development (NZBCSD) *Business Guide to a Sustainable Supply Chain, a Practical Guide*, [www.nzbcscd.org.nz/supplychain](http://www.nzbcscd.org.nz/supplychain)

Product Stewardship Institute, [www.productstewardship.us/index.cfm](http://www.productstewardship.us/index.cfm)

Recycling Council of BC, [www.rcbc.bc.ca](http://www.rcbc.bc.ca)

Reverse Logistics Executive Council, [www.rlec.org](http://www.rlec.org), especially the publication *Going Backwards: Reverse Logistics Practices and Trends*

SIGMA Project, *Supply Chain Strategy and Evaluation Final Report*, [www.projectsigma.co.uk/RnDStreams/5\\_chain.asp](http://www.projectsigma.co.uk/RnDStreams/5_chain.asp)

Supply Chain Council, [www.supply-chain.org/](http://www.supply-chain.org/)

Sustainable Retail Consortium, especially the e-tool for suppliers on how to green their marketplace, <http://clearthinkinggrp.com/sustainabilityelearning.html>

Stopwaste.org, [www.stopwaste.org](http://www.stopwaste.org)

Supply Chain & Logistics Canada (SCL), [www.sclcanada.org](http://www.sclcanada.org)

U.S. Green Building Council, [www.usgbc.org](http://www.usgbc.org)

Victoria Transport Policy Institute, particularly the *Transportation Demand Management Encyclopaedia*, Freight Transport Management chapter, [www.vtppi.org/tdm/tdm16.htm](http://www.vtppi.org/tdm/tdm16.htm)

Warehousing Education and Research Council, [werc.org](http://werc.org)

Whole Building Design Guide, [www.wbdg.org](http://www.wbdg.org), especially the resource *Balancing Security / Safety and Sustainability Objectives* at [www.wbdg.org/resources/balancing\\_objectives.php](http://www.wbdg.org/resources/balancing_objectives.php)

## COMPANIES

BC Hydro Power Smart, [www.bchydro.com/business](http://www.bchydro.com/business)

CHEP, [www.chep.com](http://www.chep.com)

LMI Government Consulting (LMI), [www.lmi.org/Services/Logistics-\(1\)/Planning/Environmental-Engineering.aspx](http://www.lmi.org/Services/Logistics-(1)/Planning/Environmental-Engineering.aspx)

Natural Logic, *Creating Value through Strategic Supply Chain Partnerships*, [www.natlogic.com/resources/publications/index.html](http://www.natlogic.com/resources/publications/index.html)

Research Triangle Institute, Solvent Alternatives Guide [www.p2pays.org/ref/19/18161/index.cfm.htm](http://www.p2pays.org/ref/19/18161/index.cfm.htm)

## PERIODICALS, ARTICLES

Blaeser, James. Environmental Sustainability Benchmark Study: Leaders Prepare for the “Greening” Supply Chain, Feb 2011, [epa.gov/smartway/transport/documents/american-shipper-green-report.pdf](http://epa.gov/smartway/transport/documents/american-shipper-green-report.pdf), accessed July 25, 2011

Facanha, Cristiano. “Environmental Assessment of Logistics Outsourcing,” *Journal of Management in Engineering* 21,1 (January 2005): 27-37. Available from [cedb.asce.org/cgi/WWWdisplay.cgi?0500171](http://cedb.asce.org/cgi/WWWdisplay.cgi?0500171), accessed Jan 2, 2006

*Hazmat Management*, [www.hazmatmag.com](http://www.hazmatmag.com)

Kovács, Gyöngyi. “Supply Chain Collaboration for Sustainability,” Business Strategy and the Environment Conference Leeds, September 4-6 2005.

Mollenkopf, Diane A and David J. Closs. “The Hidden Value of Reverse Logistics,” *Supply Chain Management Review* (July 1, 2005).

Poirier, Charles C. and Francis J. Quinn. “A Survey of Supply Chain Progress,” *Supply Chain Management Review* (September 1, 2003).

Saphire, David. “Delivering the Goods: Benefits of Reusable Shipping Containers,” 1995. Executive summary available from *Inform*, [www.informinc.org/xsum\\_deliver.php](http://www.informinc.org/xsum_deliver.php), accessed Jan 2, 2006

Trebilcock, Bob. “Warehousing Gets Lean,” *Modern Materials Handling* (December 1, 2004).

## IMPACT CALCULATORS

Due to the fact that many of these tools were developed outside of Canada, they may request different currencies or units of measurement. It is not necessary to convert the currency to benefit from these calculators.

### WASTE MANAGEMENT

Source: Metro Vancouver solid waste and recycling information

Link: <http://www.metrovancouver.org/services/solidwaste/Pages/default.aspx>

Source: U.S. EPA - WARM Online

Inputs: Waste management practices

Outputs: The benefits of alternative end-of-life waste management decisions, including greenhouse gas emissions reductions and energy savings

Link: [www.epa.gov/climatechange/wycd/waste/calculators/Warm\\_home.html](http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html)

Source: U.S. EPA – Recycled Content

Inputs: Amount and types of materials purchased (e.g. copper wire, glass, PET and cardboard, etc.)

Outputs: The benefits of alternative recycled content purchasing decisions including greenhouse gas emissions

Link: [http://www.epa.gov/climatechange/wycd/waste/calculators/ReCon\\_home.html](http://www.epa.gov/climatechange/wycd/waste/calculators/ReCon_home.html)

Source: U.S. EPA - Food Waste Management Cost Calculator

Inputs: Food management practices

Outputs: The cost competitiveness of alternatives to food waste disposal

Link: [www.epa.gov/epawaste/consERVE/materials/organics/food/tools/index.htm](http://www.epa.gov/epawaste/consERVE/materials/organics/food/tools/index.htm)

### TRANSPORTATION

Source: E3 Fleet - Idling Cost Calculator

Inputs: Types of vehicles and their present operating conditions

Outputs: financial and environmental costs of unnecessary vehicle idling and cost savings and return on investment for idling reduction technologies such as cab heaters, engine block heaters, and auxiliary power units (APUs)

Link: [www.e3fleet.com/mc/page.do?sitePageld=40919](http://www.e3fleet.com/mc/page.do?sitePageld=40919)

Source: E3 Fleet - Biodiesel Emissions Calculator

Inputs: Engine and operating information and fuel use

Outputs: Tail pipe and greenhouse gas emission reductions

Link: [www.e3fleet.com/mc/page.do?sitePageld=38606](http://www.e3fleet.com/mc/page.do?sitePageld=38606)

Source: Natural Resources Canada - Vehicle Life Cycle Cost Comparison (Business)

Inputs: Vehicle Class or Model

Output: Comparison of similar vehicles in the fields of cost, distance/time and greenhouse gas emissions

Link: <http://oee.nrcan.gc.ca/transportation/tools/life-cycle.cfm>

Source: Environment Canada - Vehicle Pollution (Personal)

Inputs: Vehicle model, year, mileage and distance travelled (km)

Outputs: Vehicle pollution generated on a given trip (carbon monoxide, NOx, hydrocarbons, CO<sub>2</sub>)

Link: <http://www.etc-cte.ec.gc.ca/databases/carpollution/default.aspx>

Source: U.S. EPA - SmartWay Savings Calculator for Fleet Owners

Inputs: Number of trucks, the gallons of fuel your company consumes, and the quantities for each technology you wish to use

Outputs: Monthly savings from purchasing the technology package outright

Link: [www.epa.gov/SmartwayLogistics/transport/calculators/loancalcfreight.htm](http://www.epa.gov/SmartwayLogistics/transport/calculators/loancalcfreight.htm)

Source: Buy Smart (EU) - LCC for Trucks & Vehicles

Inputs: Vehicle model, year, mileage, procurement details, insurance costs

Outputs: Life-cycle costs per vehicle and for the fleet

Link: <http://www.buy-smart.info/downloads2/vehicles5/vehicles6>

Source: Responsible Purchasing Network – Hybrid Calculator for Single Vehicle/Fleet

Inputs: Vehicle make, model and engine/transmission

Outputs: Comparison of emission levels

Link: [www.responsiblepurchasing.org/calculator/single.php](http://www.responsiblepurchasing.org/calculator/single.php)

#### ENERGY EFFICIENCY

Source: Clean Air Alliance (Ontario) - Electricity Choices Calculator

Inputs: Monthly electricity bill

Outputs: NOx, SO<sub>2</sub> and CO<sub>2</sub> emissions

Link: <http://www.cleanairalliance.org/choices/greenpower.html>

Source: Energy Star

Input: Number of various product types to be purchased

Output: Annual and lifetime energy, cost and emissions savings

Link: <http://oee.nrcan.gc.ca/residential/business/energystar/procurement/calculator.cfm?attr=12>

Source: Buy Smart (EU) – Greenpower

Inputs: Electricity consumption information and the price structure of the electricity offers

Outputs: Comparison of total electricity costs per MWh between offers

Link: <http://www.buy-smart.info/downloads2/green-electricity5/green-electricity4>

Source: Buy Smart (EU) – Lighting

Inputs: Lamp price, energy consumption, running costs and number of lamps

Outputs: Life-cycle of lamps comparing cost and energy efficiency

Link: <http://www.buy-smart.info/downloads2/lighting4/lighting5>

#### LIFECYCLE AND TOTAL OWNERSHIP COSTS AND CO<sub>2</sub> EMISSIONS

Source: U.S. EPA – Greenhouse Gas Equivalencies Calculator

Inputs: Units such as gallons of gasoline consumed, kilowatt-hours of electricity, therms of natural gas, or passenger vehicles per year or a quantity of emissions of specific greenhouse gases

Outputs: Amount of Carbon Dioxide emitted

Link: [www.epa.gov/cleanenergy/energy-resources/calculator.html](http://www.epa.gov/cleanenergy/energy-resources/calculator.html)

Source: ICLEI – Local Governments for Sustainability - Life-Cycle Costs and CO<sub>2</sub> Emissions of Products Calculator

Inputs: Acquisition, operation and maintenance costs

Outputs: Amount of Carbon Dioxide emitted

Link: [www.smart-spp.eu/index.php?id=7633](http://www.smart-spp.eu/index.php?id=7633)

Source: National Retail Federation

Inputs: Emissions data such as refrigerant gases, fossil fuel consumption and electricity use

Outputs: Amount of Carbon Dioxide emitted

Link: [www.nrf.com/modules.php?name=Pages&sp\\_id=1321](http://www.nrf.com/modules.php?name=Pages&sp_id=1321)

Source: Buying Solutions and Procurement Scotland - Total Cost of Ownership Calculator for PCs, Laptops and Monitors (can be applied to other products)

Inputs: Acquisition costs, operation costs and disposal costs

Outputs: Total cost of purchasing a product

Link: <http://www.scotland.gov.uk/Topics/Government/Procurement/buyer-information/spdlowlevel/routetwotoolkit/developstrategyroutetwo/profilingthecommodity/sustainability> and [www.scotland.gov.uk/Resource/Doc/116601/0105939.xls](http://www.scotland.gov.uk/Resource/Doc/116601/0105939.xls)

#### WATER USAGE

Source: Metro Vancouver – Water Audit

Inputs: Facility activities and processes, water uses (HVAC water consumption, exterior water uses and process water uses)

Outputs: Water usage

Link: <http://www.metrovancouver.org/smartsteps/bestpractices/Pages/default.aspx>

#### REFERENCES CITED IN THE TEXT

1. Greater Vancouver Gateway Council. *Keeping Greater Vancouver Moving: Discussion Paper: A 10-Year Transportation Outlook & Three-Year Financial Strategy* (September 24, 2003). Available from [www.dnv.org/upload/documents/Council\\_Reports/382917a.pdf](http://www.dnv.org/upload/documents/Council_Reports/382917a.pdf), accessed July 25, 2011
2. Definition adapted from *Business Guide to a Sustainable Supply Chain*, New Zealand Business Council of Sustainable Development. Available from [www.nzbcscd.org.nz/supplychain](http://www.nzbcscd.org.nz/supplychain), accessed Jan 2, 2006
3. See Reference 1
4. International Standards Organization and Jantzi Research, [http://ca.ishares.com/product\\_info/fund/overview/XEN.htm](http://ca.ishares.com/product_info/fund/overview/XEN.htm), accessed July 25, 2011
5. Facanha, Cristiano. "Environmental Assessment of Logistics Outsourcing," 2005. *Journal of Management in Engineering*, Vol. 21, No. 1, pp. 27-37. Available from [cedb.asce.org/cgi/WWWdisplay.cgi?0500171](http://cedb.asce.org/cgi/WWWdisplay.cgi?0500171), accessed Jan 2, 2006
6. The material in this section is largely drawn from *Five Winds' Environmental Management Systems: A Guidebook for Improving Energy and Environmental Performance in Local Government*. Available from [www.lgean.org/documents/EMSGuidebookPA.pdf](http://www.lgean.org/documents/EMSGuidebookPA.pdf), accessed July 25, 2011
7. Walsh, Kaitlin. *The Chain Gang: Promoting Sustainability in Freight Logistics*.
8. Natural Resources Canada, Office of Energy Efficiency, [oee.nrcan.gc.ca](http://oee.nrcan.gc.ca)
9. U.S. Green Building Council, [www.usgbc.org](http://www.usgbc.org)
10. Whalen, Jim. "Energy Efficient Materials Handling," 2002. *Modern Materials Handling*, [www.highbeam.com/doc/1G1-82137412.html](http://www.highbeam.com/doc/1G1-82137412.html)
11. *Business Guide to a Sustainable Supply Chain*, New Zealand Business Council of Sustainable Development. Available from [www.nzbcscd.org.nz/supplychain](http://www.nzbcscd.org.nz/supplychain)
12. The Centre for Sustainable Transportation. *Sustainable Transportation Monitor*, No. 10 (June 2004), [cst.uwinnipeg.ca/documents/STM10E.pdf](http://cst.uwinnipeg.ca/documents/STM10E.pdf)
13. The Centre for Sustainable Transportation. *Sustainable Transportation Monitor*, No. 4 (April 2001), [cst.uwinnipeg.ca/documents/STM4English.pdf](http://cst.uwinnipeg.ca/documents/STM4English.pdf)
14. Information in table adapted from information provided by Natural Resources Canada, Office of Energy Efficiency [oee.nrcan.gc.ca/transportation/business/fuels.cfm?attr=16](http://oee.nrcan.gc.ca/transportation/business/fuels.cfm?attr=16)
15. The Centre for Sustainable Transportation. *Sustainable Transportation Monitor*, No. 11 (June 2005), [cst.uwinnipeg.ca/documents/STM11E.pdf](http://cst.uwinnipeg.ca/documents/STM11E.pdf)
16. Saphire, David. "Delivering the Goods: Benefits of Reusable Shipping Containers," 1995. Executive summary accessed at *Inform*, [www.informinc.org/reports\\_waste.php](http://www.informinc.org/reports_waste.php), Jan 2, 2006
17. Stop Waste Partnership best practices database. Available from [www.stopwaste.org](http://www.stopwaste.org), accessed Jan 2, 2006
18. Rogers, Dr. Dale S. and Dr. Ronald S. Tibben-Lembke. *Going Backwards: Reverse Logistics Trends and Practices*, 1998. Available from Reverse Logistics Executive Council, [www.rlec.org](http://www.rlec.org), accessed Jan 2, 2006
19. David Schatsky, *Benchmarking Environmental Sustainability Goals*, <http://www.environmentalleader.com/2011/07/25/benchmarking-environmental-sustainability-goals/>, accessed July 25, 2011
20. UN Global Compact and Business for Social Responsibility. *Supply Chain Sustainability: A Practical Guide for Continuous Improvement*, [http://www.unglobalcompact.org/docs/news\\_events/8.1/Supply\\_Chain\\_Sustainability.pdf](http://www.unglobalcompact.org/docs/news_events/8.1/Supply_Chain_Sustainability.pdf), accessed July 25, 2011