Sustainable Supply Chain Logistics Guide
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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.

ORGANIZATION OF THE GUIDE
The Guide is organized into nine 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 to 6 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.

Section 7 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.

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.
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.¹

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

SUPPLY CHAIN MANAGEMENT INTEGRATES ALL OF THESE FUNCTIONS

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/smartsteps/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.


Other resources include the Fraser Basin Council (SmartFleet, idle free program), Sustainable Purchasing Network and the BC Supply Chain Council.
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.\textsuperscript{2}

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

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

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.\textsuperscript{3} 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.

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**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.

## BUSINESS TRENDS AND IMPLICATIONS FOR SUSTAINABLE SCL

The motivation to lower costs through SCL efficiency provides built-in business incentives to pursue sustainable SCL, since many SCL efficiencies also produce environmental and social benefits.

In addition, the following business trends suggest a growing need for companies to consider the environmental and social impacts of their SCL activities.

### BUSINESS TREND

<table>
<thead>
<tr>
<th>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.</th>
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<tbody>
<tr>
<td>Corporate social responsibility statements are increasingly prevalent.</td>
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<tr>
<td>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.</td>
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<td>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.</td>
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<td>Local governments are adopting extended producer responsibility policies and regulations to transfer responsibility for and costs of waste from taxpayers to producers.</td>
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<tr>
<td>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.</td>
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<table>
<thead>
<tr>
<th>IMPLICATIONS FOR SUSTAINABLE SCL</th>
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<tr>
<td>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.</td>
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<tr>
<td>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.</td>
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<tr>
<td>To deliver on corporate commitments, SCL functions will be expected to enhance—not undermine—stated corporate responsibility positions.</td>
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<td>SCL efficiencies can contribute to reducing GHG emissions. New government programs offer incentives for capital improvements that lower emissions and improve energy efficiency.</td>
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<td>Increasing order fulfillment costs are driving companies towards lighter weight and more efficient packaging and transportation methods.</td>
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<tr>
<td>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.</td>
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<tr>
<td>The freight transportation industry will be significantly affected by higher fuel prices and policies that discourage the use of fossil fuels.</td>
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“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, ctl.mit.edu/public/sc2020_environmental_pressures_discussion_paper.pdf*
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 (www.jantzisocialindex.com/)—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. 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

Financial Benefits
- Increased revenue
- Reduced costs
- Increased asset utilization
- Enhanced customer service

Environmental Benefits
- Reduced waste
- Reduced fossil fuel consumption
- Reduced air and water emissions
- Increased energy efficiency

Social Benefits
- Reduced community impacts (noise, traffic congestion, health and safety, etc.)
- Corporate social responsibility (public perception and expectation)

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

The benefits of sustainable SCL best practices are summarized in the table on the following page. More details about each best practice are provided on the page numbers shown in brackets.
### SUSTAINABLE SCL PRACTICE

<table>
<thead>
<tr>
<th>PRIMARY AREAS OF BENEFIT</th>
<th>FINANCIAL</th>
<th>ENVIRONMENTAL</th>
<th>SOCIAL</th>
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<tr>
<td><strong>Revenue Enhancement</strong></td>
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<td><strong>Cost Reduction</strong></td>
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<td><strong>Improved Customer Service</strong></td>
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<td><strong>Improved Asset Utilization</strong></td>
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<td><strong>Waste Reduction</strong></td>
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<td><strong>Energy Efficiency</strong></td>
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<td><strong>Emission Reduction</strong></td>
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<td><strong>Fuel Conservation</strong></td>
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<td><strong>Other Environmental Conservation</strong></td>
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<td><strong>Social Impact Reduction (noise, congestion, health, etc.)</strong></td>
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#### Plan 1: Increase forecast accuracy (p. 12)
- ![Icon] Revenue Enhancement
- ![Icon] Cost Reduction
- ![Icon] Improved Customer Service
- ![Icon] Improved Asset Utilization
- ![Icon] Waste Reduction
- ![Icon] Energy Efficiency
- ![Icon] Emission Reduction
- ![Icon] Fuel Conservation
- ![Icon] Other Environmental Conservation
- ![Icon] Social Impact Reduction (noise, congestion, health, etc.)

#### Plan 2: Consider SCL in product lifecycle management (p. 12)
- ![Icon] Revenue Enhancement
- ![Icon] Cost Reduction
- ![Icon] Improved Customer Service
- ![Icon] Improved Asset Utilization
- ![Icon] Waste Reduction
- ![Icon] Energy Efficiency
- ![Icon] Emission Reduction
- ![Icon] Fuel Conservation
- ![Icon] Other Environmental Conservation
- ![Icon] Social Impact Reduction (noise, congestion, health, etc.)

#### Plan 3: Optimize SCL network design (p. 13)
- ![Icon] Revenue Enhancement
- ![Icon] Cost Reduction
- ![Icon] Improved Customer Service
- ![Icon] Improved Asset Utilization
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#### Plan 4: Implement an environmental management system (p. 14)
- ![Icon] Revenue Enhancement
- ![Icon] Cost Reduction
- ![Icon] Improved Customer Service
- ![Icon] Improved Asset Utilization
- ![Icon] Waste Reduction
- ![Icon] Energy Efficiency
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- ![Icon] Social Impact Reduction (noise, congestion, health, etc.)

#### Store 1: Incorporate sustainability factors in new warehouse development (p. 16)
- ![Icon] Revenue Enhancement
- ![Icon] Cost Reduction
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- ![Icon] Improved Asset Utilization
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- ![Icon] Social Impact Reduction (noise, congestion, health, etc.)

#### Store 2: Optimize warehouse layout and workflow (p. 17)
- ![Icon] Revenue Enhancement
- ![Icon] Cost Reduction
- ![Icon] Improved Customer Service
- ![Icon] Improved Asset Utilization
- ![Icon] Waste Reduction
- ![Icon] Energy Efficiency
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- ![Icon] Social Impact Reduction (noise, congestion, health, etc.)

#### Store 3: Increase energy efficiency of warehouse operations (p. 18)
- ![Icon] Revenue Enhancement
- ![Icon] Cost Reduction
- ![Icon] Improved Customer Service
- ![Icon] Improved Asset Utilization
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- ![Icon] Fuel Conservation
- ![Icon] Other Environmental Conservation
- ![Icon] Social Impact Reduction (noise, congestion, health, etc.)

#### Store 4: Reduce inventory obsolescence or degradation (p. 19)
- ![Icon] Revenue Enhancement
- ![Icon] Cost Reduction
- ![Icon] Improved Customer Service
- ![Icon] Improved Asset Utilization
- ![Icon] Waste Reduction
- ![Icon] Energy Efficiency
- ![Icon] Emission Reduction
- ![Icon] Fuel Conservation
- ![Icon] Other Environmental Conservation
- ![Icon] Social Impact Reduction (noise, congestion, health, etc.)

#### Store 5: Handle and store hazardous materials safely (p. 19)
- ![Icon] Revenue Enhancement
- ![Icon] Cost Reduction
- ![Icon] Improved Customer Service
- ![Icon] Improved Asset Utilization
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- ![Icon] Energy Efficiency
- ![Icon] Emission Reduction
- ![Icon] Fuel Conservation
- ![Icon] Other Environmental Conservation
- ![Icon] Social Impact Reduction (noise, congestion, health, etc.)

#### Store 6: Automate inventory handling and management processes (p. 20)
- ![Icon] Revenue Enhancement
- ![Icon] Cost Reduction
- ![Icon] Improved Customer Service
- ![Icon] Improved Asset Utilization
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- ![Icon] Energy Efficiency
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- ![Icon] Fuel Conservation
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- ![Icon] Social Impact Reduction (noise, congestion, health, etc.)

#### Transport 1: Manage lifecycle performance of delivery fleet (p. 22)
- ![Icon] Revenue Enhancement
- ![Icon] Cost Reduction
- ![Icon] Improved Customer Service
- ![Icon] Improved Asset Utilization
- ![Icon] Waste Reduction
- ![Icon] Energy Efficiency
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- ![Icon] Fuel Conservation
- ![Icon] Other Environmental Conservation
- ![Icon] Social Impact Reduction (noise, congestion, health, etc.)

#### Transport 2: Shift to modes or equipment that use less fossil fuel (p. 23)
- ![Icon] Revenue Enhancement
- ![Icon] Cost Reduction
- ![Icon] Improved Customer Service
- ![Icon] Improved Asset Utilization
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#### Transport 3: Reduce & optimize transportation loads and routes (p. 24)
- ![Icon] Revenue Enhancement
- ![Icon] Cost Reduction
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#### Transport 4: Reduce & use reusable or recyclable shipping materials (p. 25)
- ![Icon] Revenue Enhancement
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- ![Icon] Improved Asset Utilization
- ![Icon] Waste Reduction
- ![Icon] Energy Efficiency
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#### Transport 5: Transport hazardous materials safely (p. 26)
- ![Icon] Revenue Enhancement
- ![Icon] Cost Reduction
- ![Icon] Improved Customer Service
- ![Icon] Improved Asset Utilization
- ![Icon] Waste Reduction
- ![Icon] Energy Efficiency
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- ![Icon] Fuel Conservation
- ![Icon] Other Environmental Conservation
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#### Reverse Logistics 1: Optimize efficiency of product returns (p. 28)
- ![Icon] Revenue Enhancement
- ![Icon] Cost Reduction
- ![Icon] Improved Customer Service
- ![Icon] Improved Asset Utilization
- ![Icon] Waste Reduction
- ![Icon] Energy Efficiency
- ![Icon] Emission Reduction
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- ![Icon] Other Environmental Conservation
- ![Icon] Social Impact Reduction (noise, congestion, health, etc.)

#### Reverse Logistics 2: Implement high-value, low-waste disposition strategies (p. 29)
- ![Icon] Revenue Enhancement
- ![Icon] Cost Reduction
- ![Icon] Improved Customer Service
- ![Icon] Improved Asset Utilization
- ![Icon] Waste Reduction
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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 18 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 profiles of Catalyst Paper on pages 27 and 36 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; nevertheless, they have value and should be considered in decision-making.
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.”


**MORE RESOURCES**

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.5

**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. 6 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 logistics7 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.”


**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

**MORE RESOURCES**

International Standards Organization (ISO),
www.iso.org

Environment Canada, EMS Info Page,
www.ec.gc.ca/default.asp?lang=En&n=FD9B0E51-1

Canadian Standards Association,
www.csa.ca/standards/environment
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
Canada Green Building Council, www.cagbc.org
• 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 25, 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\(^8\) 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\%.\(^9\)
- **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.

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**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**
• 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.  

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. 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 15 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:

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

- **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**
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.

DID YOU KNOW
Regular maintenance may improve fuel efficiency by up to 15%.


MORE RESOURCES


Metro Vancouver Transportation SmartSteps Guide, [www.metrovancouver.org/about/publications/Publications/SG-Transportation1.pdf](http://www.metrovancouver.org/about/publications/Publications/SG-Transportation1.pdf)
• 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. 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. 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. The profile of Purolator on page 21 is a good example of a company achieving benefits through the use of alternative-energy vehicles.

<table>
<thead>
<tr>
<th>ALTERNATIVE ENERGY/TECHNOLOGY</th>
<th>BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biodiesel</strong> is made from low-cost waste materials such as slaughterhouse waste, recycled cooking oil, animal fats, trap grease and oilseed crops.</td>
<td>Lowers GHG emissions while also addressing waste management issues.</td>
</tr>
<tr>
<td><strong>Ethanol</strong> is a blend of liquid alcohol and gasoline. Growing grain or other biomass used to make ethanol absorbs carbon dioxide, further reducing GHG emissions.</td>
<td>Burns more cleanly than gasoline or diesel.</td>
</tr>
<tr>
<td><strong>Hybrid electric vehicles</strong> (HEVs) combine a battery with a conventional internal combustion engine. Combines extended driving range and rapid refuelling of conventional fuels with environmental benefits of electricity.</td>
<td>Little to no tailpipe emissions except for heat and water vapour. Little to no GHG emissions depending on the source of hydrogen.</td>
</tr>
<tr>
<td><strong>Battery-electric vehicles</strong> are powered by a motor that draws electricity from on-board storage battery. Produces fewer toxic pollutants and GHG emissions than gasoline or diesel. Costs about 30–40% less than gasoline.</td>
<td>Produces 20% fewer GHG emissions and fewer toxic pollutants than gasoline.</td>
</tr>
<tr>
<td><strong>Liquefied natural gas</strong> is being tested for heavy-duty trucks in line-haul applications using Vancouver-based Westport Innovations technology.</td>
<td>Produces fewer toxic pollutants and GHG emissions than gasoline or diesel. Costs about 30–40% less than gasoline.</td>
</tr>
</tbody>
</table>
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. 15

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 25 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.

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**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

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**MORE RESOURCES**

Victoria Transport Policy Institute, particularly the Transportation Demand Management Encyclopaedia, Freight Transport Management chapter, www.vtpi.org/tdm/tdm16.htm

The Centre for Sustainable Transportation, www.cstctd.org
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. 16

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. 17 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.

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**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

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**MORE RESOURCES**

Canadian Pallet Council,
www.cpcpallet.com

CHEP, 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

Greenlight Pallet Company
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.

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**MORE RESOURCES**

Transport Canada, Transport Dangerous Goods Directorate,  
www.tc.gc.ca/tdg/menu.htm

Transportation Safety Board,  
www.tsb.gc.ca/

Dangerous Goods Advisory Council,  
www.hmac.org

Hazmat Management magazine,  
www.hazmatmag.com

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**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
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; 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

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**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.

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**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**

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**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.

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.

**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.

7 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. The results from your assessment may then be used to identify sustainable SCL improvement opportunities at your company (Step 3 of the implementation actions starting on page 37 of the Guide). Start with the areas that you rated as having low performance and high importance.
PLAN 1
1. Integrate internal sales and operational planning processes and systems.
2. Collaborate with customers on forecasting and planning.
3. Collaborate with suppliers on forecasting and planning.
4. Electronically collect and share sales, inventory, order, production and delivery data.

PLAN 2
1. Consider logistics efficiencies in product and/or packaging design.
2. Base product design, purchasing and manufacturing decisions on lifecycle costs.

PLAN 3
1. Use supply chain optimization software to optimize location, distance, load, service and environmental variables in SCL network decisions.
2. Outsource SCL functions that can be more efficiently and cost-effectively performed by third parties.

PLAN 4
1. Collect and analyze data to understand environmental impacts and risks of SCL activities.
2. Understand gaps between ISO 14001 requirements and your existing environmental management program.
3. Implement robust environmental management program to manage SCL impacts.

STORE 1
1. Follow LEED criteria in building design.
2. Select site and situate building to minimize traffic and noise impacts on community.
3. Use building products and materials with recycled content.
4. Implement soil erosion measures.
5. Implement rainwater collection and storage systems.

STORE 2
1. Share excess warehouse space with other users.
2. Optimize safety and efficiency of warehouse layout.
3. Relate receiving and shipping operations to the flow of goods.
4. Make full use of available warehouse height for cartons, pallets and racking.
### STORE 2 CONTINUED

5. Optimize efficiency of picking methodology.  
6. Train employees on efficient workflow.

<table>
<thead>
<tr>
<th>PERFORMANCE</th>
<th>IMPORTANCE</th>
</tr>
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<tbody>
<tr>
<td>Low</td>
<td>High</td>
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### STORE 3

1. Designate responsibility for energy efficiency and conduct energy audit.  
2. Use formal commissioning process for new buildings and/or recommissioning process for existing buildings.  
3. Adopt techniques to measure and reduce energy consumption from lights, HVAC.  
4. Adopt techniques to improve energy efficiency of loading processes.  
5. Recover and reuse waste heat.  
6. Implement energy efficient materials handling equipment.

### STORE 4

1. Reduce the number of stock-keeping units through vendor consolidation or standardization.  
2. Include risk of obsolescence in calculating economic order quantities.  
3. Implement vendor-managed inventory or material return programs.  
4. Consolidate storage of inventory to controlled locations.

### STORE 5

1. Replace hazmat with non-hazardous alternatives where possible.  
2. Train warehouse workers on safe handling and storage of hazardous materials.  
3. Inspect tanks or containers used to store hazardous materials and correct deficiencies.  
4. Segregate containers used to store hazardous materials.  
5. Schedule regular removal and proper disposal of hazardous waste.

### STORE 6

1. Implement bar coding, RFID, or MRP technology to track inventory precisely.  
2. Implement automated storage and handling systems.  
3. Use mechanical handling equipment powered by alternative energy.

### TRANSPORT 1

1. Source vehicles with fuel-efficient and low-emission technologies or designs.  
2. Perform regular preventive vehicle maintenance.  
3. Institute fuel-efficient practices and train and reward drivers on their use.  
4. Train drivers on fuel-efficient fleet practices.  
5. Use fuel monitoring devices in vehicles.  
6. Implement driver incentive programs to recognize fuel efficiency.
### TRANSPORT 2
1. Choose fuel-efficient modes of transport.  
2. Use freight vehicles fuelled by alternative energy.

### TRANSPORT 3
1. Minimize/standardize product packaging, pallets and containers.  
2. Use load planning tools to optimize loads.  
3. Maximize bi-directional load factors.  
4. Use route planning tools to minimize transport distances.  
5. Schedule deliveries to avoid peak traffic periods.  
6. Work with local suppliers to avoid longer inbound transport distances.  
7. Influence suppliers’ transport routes, modes and loading practices.

### TRANSPORT 4
1. Use reusable or, at minimum, recycled shipping containers.  
2. Use recyclable plastic pallets in place of wooden.  
3. If impractical to use reusable containers, enroll in a pallet or container pooling service.  
4. Use reusable tie-down straps and bands.  
5. Design packaging to be recycled.

### TRANSPORT 5
1. Understand and comply with applicable hazardous materials transportation regulations.  
2. Develop and implement a dangerous goods transportation security plan.  
3. Train employees on safe handling and transportation of hazardous materials.  
4. Use load planning software to guard against inappropriate co-loading of hazardous materials.  
5. Inspect containers used to transport hazardous materials and correct deficiencies.

### REVERSE LOGISTICS 1
1. Design products and packaging to facilitate recovery and reuse/recycling.  
2. Implement a product take-back program.  
3. Ensure return reasons and disposition status are clear throughout returns process.  
4. Implement a centralized returns centre.  
5. Outsource product returns to a specialized third party.

### REVERSE LOGISTICS 2
1. Determine disposition strategy for whole product and for individual parts to determine best use.  
2. Recondition, cannibalize, or recycle returned products.  
3. Where reuse not possible, reclaim recyclable materials and safely dispose.  
4. Donate serviceable returned products.
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 the critical success factors and suggested approaches for mounting sustainable SCL improvement initiatives to achieve real financial and sustainability benefits.
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).

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

1. Involve a cross-functional team and build executive support.
2. Determine the sustainability objectives of SCL in your organization and align them with corporate objectives.
3. Identify and select improvement opportunities, starting with areas where early successes can be achieved to establish credibility.
4. Build the business case.
5. Implement and measure with a commitment to 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. Involve a cross-functional team and build executive support

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.
- **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.

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.


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).
• 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. Determine the sustainability objectives of SCL in your organization and align them 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.

• Demonstrate how sustainability goals can add value to SCL practices, rather than how SCL practices can meet sustainability goals.

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**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.

**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

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- Improved employee morale and productivity
- Reduced costs due to process efficiencies
- More effective product returns function
• **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. **Identify and select improvement opportunities, starting with areas where early successes can be achieved 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 7 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.

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**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

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**Did You Know**

Refer to Section 7 to map performance assessment scores in the matrix below. This will help you prioritize sustainable SCL opportunities.
• 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. **Build the business case**

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.

• 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. Implement and measure with a commitment to 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 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.

• 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 performance indicators and promote and celebrate your successes.

• Repeat the above process, with a commitment to continuous improvement.

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 CO2 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/
9 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 Environment, www.gov.bc.ca/env
Industry Canada, logistics industry profile, www.ic.gc.ca/eic/site/dsib-logic.nsf/eng/home
Natural Resources Canada Office of Energy Efficiency, oee.nrcan.gc.ca
Transportation Safety Board, www.tsb.gc.ca

U.S. AND INTERNATIONAL GOVERNMENT
European Union Integrated Product Policy, ec.europa.eu/environment/ipp/

ASSOCIATIONS AND NON-GOVERNMENTAL ORGANIZATIONS
BC BioFleet, www.bcbiofleet.ca
Buildinggreen.com, www.buildinggreen.com
Building Owners and Managers Association of BC (BOMA), Go-Green program, www.boma.bc.ca/gogreen.php
Business for Social Responsibility, 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
Canadian Pallet Council, www.cpcpallet.com
Canadian Standards Association, www.csa.ca/standards/environment
Centre for Sustainable Transportation, especially the Sustainable Transportation Monitor publications, cst.uwinnipeg.ca/monitor.html
Clean Air Corridor Demonstration Project
Council of Supply Chain Management Professionals, www.cscmp.org
Fleet Challenge Canada, www.fleetchallenge.ca
Fraser Basin Council, www.fraserbasin.bc.ca
Fuel Cells Canada, www.fuelcellscanada.ca
International Standards Organization (ISO), [www.iso.org](http://www.iso.org)


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)


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.vtpi.org/tdm/tdm16.htm](http://www.vtpi.org/tdm/tdm16.htm)

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


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), *Best Practices in Implementing Green Supply Chains*


Research Triangle Institute, Solvent Alternatives Guide

PERIODICALS, ARTICLES


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)


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