

Green Supply Chain Management



Manufacturing – A Canadian Perspective



**Green Supply Chain Management:
Manufacturing –
A Canadian Perspective**

This publication is also available electronically on the World Wide Web in HTML format at the following address:

www.ic.gc.ca/logistics

Permission to Reproduce

Except as otherwise specifically noted, the information in this publication may be reproduced, in part or in whole and by any means, without charge or further permission from Industry Canada, provided that due diligence is exercised in ensuring the accuracy of the information reproduced; that Industry Canada is identified as the source institution; and that the reproduction is not represented as an official version of the information reproduced, nor as having been made in affiliation with, or with the endorsement of, Industry Canada.

For permission to reproduce the information in this publication for commercial redistribution, please email:

copyright.droitdauteur@pwgsc.gc.ca

lu44-74/3-2009E

978-1-100-13651-6

Aussi offert en français sous le titre

**Gestion de la chaîne d'approvisionnement verte :
Perspective canadienne du secteur manufacturier**

Green Supply Chain Management

Manufacturing – A Canadian Perspective



Highlights

With increased attention to corporate responsibility and the requirement to comply with environmental regulations, green supply chain management (GSCM) is becoming increasingly important for Canadian manufacturers. While the value of GSCM activities is rarely disputed, literature to-date has been sparse in presenting tangible evidence regarding performance and business benefits. For this reason, Supply Chain and Logistics Association Canada (SCL) and Canadian Manufacturers & Exporters (CME) partnered with Industry Canada to review the important service business function of GSCM. This resulting report provides unique insights to help Canadian manufacturing supply chain executives understand current trends and to recognize the benefits of adopting GSCM practices in distribution activities.

Companies that have adopted GSCM practices with a focus on distribution activities have successfully improved their business and environmental performance on many levels.

Key findings:

- Most Best-in-Class (BiC)* businesses are able to better differentiate their distribution services, improve risk management, increase sales, and increase access to foreign markets, all while reducing distribution costs.
- Main GSCM business drivers include the high cost of energy and a desire to have a competitive advantage over other firms.
- The reduction of energy consumption and lowered greenhouse gas (GHG) emissions in distribution activities are the two main environmental improvements arising from the adoption of GSCM practices.
- Since many GSCM practices require limited investment, are low-risk, and offer short-term return-on-investment periods, businesses of all sizes are able to engage in these activities.
- Despite the large number of businesses that understand the importance of GSCM, the number of firms that actually engage in such practices is significantly lower.

Approach and methodology

This report is based on a collaborative undertaking between SCL's research committee, CME, and Industry Canada's Service Industries and Consumer Products Branch. The SCL research committee and the CME defined industry needs, drivers, and metrics and offered valuable insights from an industry perspective. By using the 2008 Green Supply Chain Survey (1,165 business entities which included more than 600 manufacturing organisations)⁷ conducted by SCL, and applying unique economic models developed in-house, Industry Canada provided the overall analysis and brought together all the components needed to produce a Green Supply Chain Management report for Canada's manufacturing sector.

This report is one of a series of three GSCM reports:

- *GSCM: Manufacturing — A Canadian Perspective;*
- *GSCM: Logistics & Transportation Services — A Canadian Perspective;* and
- *GSCM: Retail Chains & Consumer Product Goods — A Canadian Perspective.*

* Best-in-Class (BiC) businesses are defined as businesses that achieve positive environmental benefits in the two main sector-specific GSCM practices.

Table of Contents

<i>Background</i>	4 ›
<i>GSCM Practices: Drivers and Adoption</i>	4 ›
<i>Environmental Benefits of GSCM Practices</i>	6 ›
<i>Business Benefits of GSCM Practices</i>	6 ›
<i>BiC GSCM Processes and Technologies</i>	7 ›
<i>Final Remarks</i>	8 ›
<i>References</i>	9 ›
<i>Annex I: Best-in-Class Manufacturing Analysis</i>	10 ›

Table of Figures

<i>Figure 1: Main drivers for implementing GSCM practices in distribution activities</i>	4 ›
<i>Figure 2: Perspectives on and use of GSCM practices in distribution activities</i>	5 ›
<i>Figure 3: Use of GSCM practices in distribution activities — Business size</i>	5 ›
<i>Figure 4: Main GSCM practices implemented in distribution activities</i>	5 ›
<i>Figure 5: Main GSCM practices implemented in distribution activities with customers</i>	6 ›
<i>Figure 6: Environmental improvements stemming from GSCM practices in distribution activities</i>	6 ›
<i>Figure 7: Business benefits — BiC manufacturers</i>	7 ›
<i>Figure 8: BiC processes used to implement GSCM practices in distribution activities</i>	7 ›
<i>Figure 9: Distribution centre processes — BiC manufacturers</i>	7 ›
<i>Figure 10: Transportation technologies and processes — BiC manufacturers</i>	8 ›



Background

Canadian firms must continuously introduce new and innovative business processes to remain competitive. Many Canadian manufacturers are differentiating themselves by developing green supply chain management (GSCM) solutions within their organizations or through mandates[†] with their customers and/or suppliers.

GSCM integrates environmental thinking into supply chain management (SCM). For the purpose of this report, this includes introducing technical and innovative processes into materials sourcing and selection, delivery of the final product to consumers, and end-of-life product management. The intended result is to improve a business' environmental impact while increasing efficiency and growth within its own supply chain.

GSCM practices that are being implemented in distribution activities include:

- Energy efficiency;
- Reduction of greenhouse gas (GHG) emissions;
- Water conservation or processing;
- Waste reduction;
- Reduced packaging/increased use of biodegradable packaging;
- Product and packaging recycling/re-use; and
- Green procurement practices.

Supply Chain & Logistics Association Canada (SCL)² and Canadian Manufacturers & Exporters (CME) have partnered with Industry Canada to develop research on GSCM practices and their business benefits. Specific business improvements include greater differentiation in distribution services, successful compliance, increased sales, new access to foreign markets, better customer retention, decreased distribution cost, enhanced risk management, and improved distribution efficiency.

This research report identifies industry perspectives, issues, and drivers for GSCM practices to help inform policy makers of current and future industry needs.

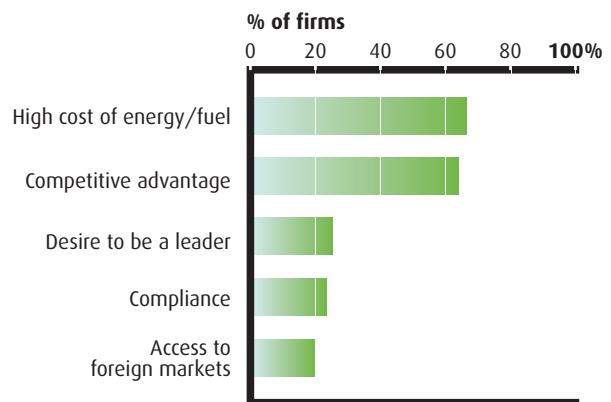
This report also provides insights on the:

- Internal and external pressures involved in adopting GSCM practices;
- Importance and use of GSCM practices by manufacturers;
- Specific GSCM practices that manufacturers use;
- Environmental benefits gained by implementing GSCM practices; and
- Business benefits gained by Best-in-Class (BiC) manufacturers and the GSCM technologies and processes used to achieve them.

GSCM Practices: Drivers and Adoption

Canadian manufacturers view high cost of energy and the need to be competitive as the main drivers for implementing GSCM practices in distribution activities (Figure 1). Other pressures, such as compliance with regulations, a desire to be a market leader, and access to foreign markets are also important factors driving businesses to consider implementing GSCM practices.¹ To make GSCM initiatives successful in the manufacturing industry, environmental benefits and positive Net Present Value (NPV) for the firm must also be achieved.²

FIGURE 1
Main drivers for implementing GSCM practices in distribution activities¹

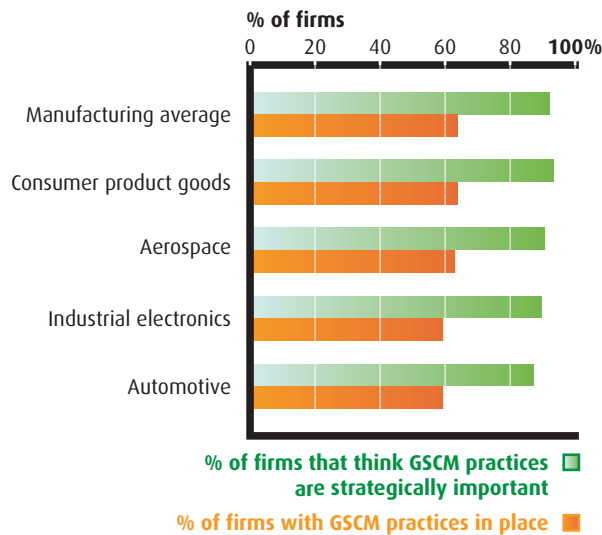


GSCM is viewed as strategically important by 92% Canadian manufacturers (Figure 2). But despite the large number of businesses that understand the importance of GSCM, the number of firms that actually engage in such practices is significantly lower. Only two out

[†] Supply chain compliance mandate (SCCM) refers to systems or departments within corporations that ensure supply chain participants are aware of and take steps to comply with a clearly defined specification and/or standard.

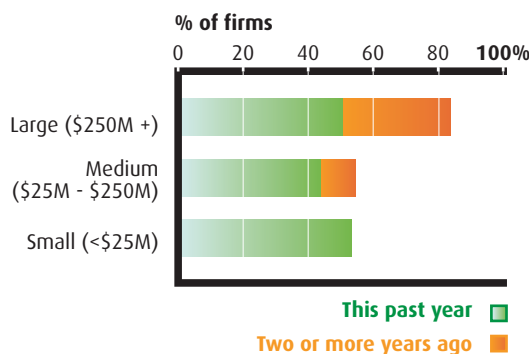
of three manufacturers actually implement GSCM practices in their distribution activities.⁷

FIGURE 2
Perspectives on and use of GSCM practices in distribution activities¹



Firm size may no longer influence whether GSCM activities are pursued. In the past, more large- and medium-scale Canadian businesses were engaged in GSCM practices. Recently, however, a greater number of small-scale businesses have begun to initiate GSCM practices, catching up with larger firms (Figure 3). Since many GSCM practices require limited investment, are low-risk, and offer short-term return-on-investment periods, businesses of all sizes are able to engage in these activities.²

FIGURE 3
Use of GSCM practices in distribution activities – Business size¹

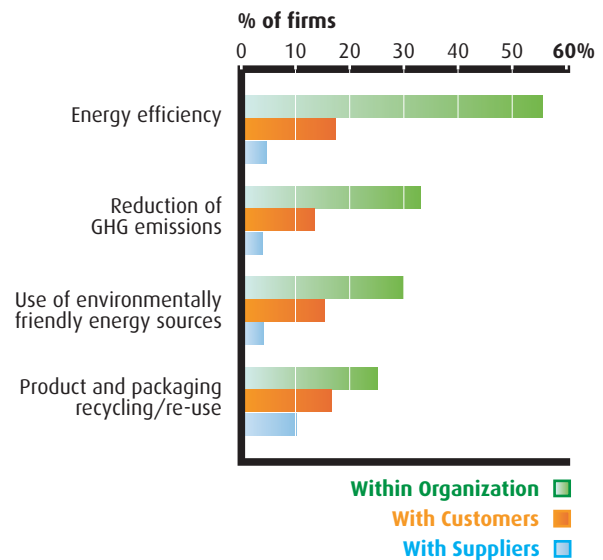


GSCM practices can be applied at different points in the distribution supply chain, either within the organization

or in collaboration with customers and suppliers. Manufacturers are implementing most GSCM practices within their own organizations — a less complex solution than developing a whole supply chain approach. The most common GSCM practice is implementing energy efficient improvements in distribution activities, such as the use of low-voltage conveyors and motion detector lights in distribution centres (DCs).¹

A smaller number of businesses are engaging in these practices in collaboration with their customers and suppliers (Figure 4). This consistent difference across practices indicates that manufacturers are focusing more on improving their own activities at the initial stage of GSCM.

FIGURE 4
Main GSCM practices implemented in distribution activities¹



Another common GSCM practice is to reduce GHG emissions in distribution activities. Manufacturers can participate in a program where carbon credits are granted according to the amount of GHG that a business emits in its operations, and unused credits can be sold to other companies.

In addition, some manufacturers are reducing GHG emissions by implementing a GSCM scorecard in distribution activities.⁸ Not only does this emphasize a business's environmental commitment, but it can also

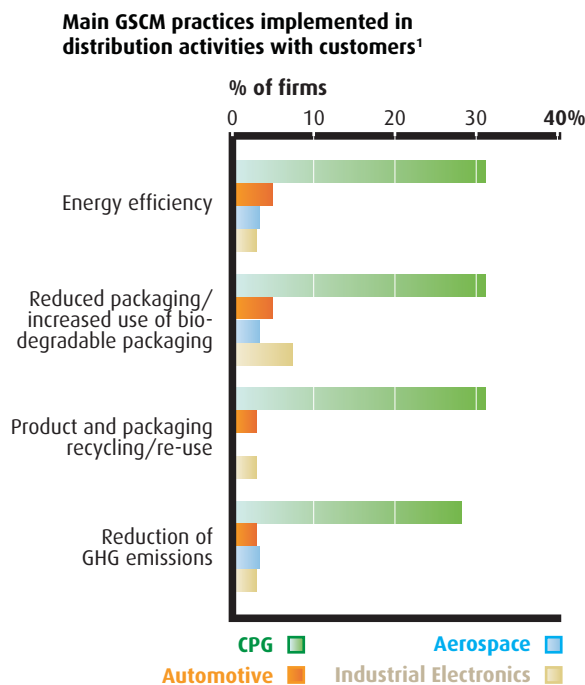
⁸ A GSCM scorecard refers to the use of metrics to evaluate the evolution of specific key performance indicators.



be used to assess supply chain partners' environmental impacts and improvements. Companies that have used this process have noted considerable reductions in their waste, packaging material, and carbon emissions. This has led to significant savings in distribution costs, as well as a general decline in carbon emissions.²

The adoption of GSCM practices within organizations is similar across manufacturing sub-sectors, but differs widely in the area of collaborative applications with customers. As a result of retail chain GSCM mandates in distribution activities, close to six times as many consumer product goods (CPG)[‡] manufacturers have engaged in GSCM practices with their customers (retail chains) than have automotive, aerospace, and industrial electronics manufacturers (Figure 5).

FIGURE 5

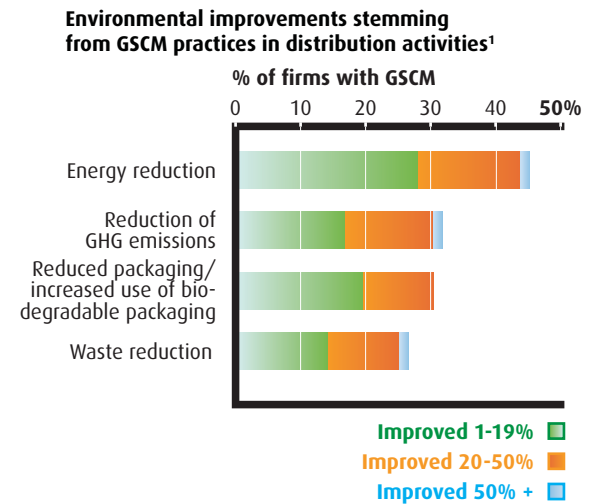


If past experience holds true, where non-CPG industrial sectors followed the retail sector's lead in introducing innovation mandates (such as Electronic Data Interchange), these sectors are then expected to initiate GSCM mandates with their suppliers in the coming years.²

Environmental Benefits of GSCM Practices

Canadian manufacturers' goals in implementing GSCM practices are to gain both environmental and business benefits. The main environmental improvements across all main sectors stemming from GSCM practices are improvements in energy usage and reductions in GHG emissions in distribution activities (Figure 6). Other benefits include reduced packaging, increased use of biodegradable packaging, and decreased waste.¹

FIGURE 6



Due to the impact of retail chain GSCM mandates, CPG businesses reported 35% greater environmental improvements compared to the aerospace, automotive, and industrial electronics sub-sectors.¹

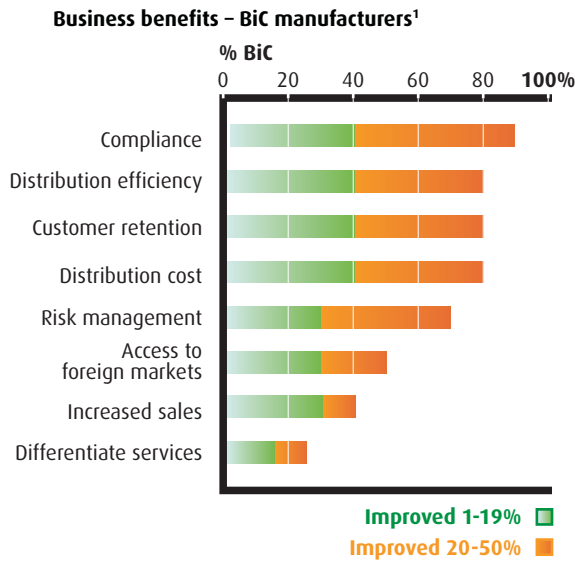
Business Benefits of GSCM Practices

Best-in-Class (BiC) firms are defined as businesses that achieve positive environmental benefits in the two main GSCM practices specific to the firms' sector. For manufacturers in general, these benefits are reduced energy usage and lowered GHG emissions in distribution activities. Of the BiC manufacturers, 80% noted improvements in distribution costs, customer retention and distribution efficiency, and 90% of BiC firms reported an improvement in compliance processes (Figure 7). In each case, half of BiC firms showed a 20-50% improvement. Other business benefits include improved risk management, greater access to foreign markets, increased sales, and enhanced differentiation

[‡] CPG manufacturers are companies that design, manufacture, and market apparel, food, jewellery, dolls, toys, games, cleaning products, hand and power tools, home furniture, housewares, sporting goods, linens, and consumer electronics and appliances.

in distribution services (See Annex 1 for sector-specific business benefits).

FIGURE 7



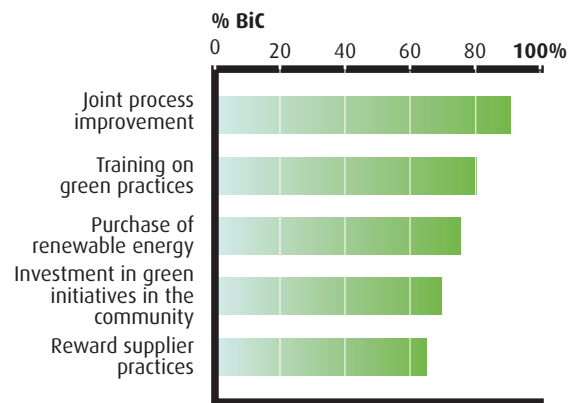
The business benefits differ within specific manufacturing industries; for example, the most common benefits for BiC automotive manufacturers are improved access to foreign markets, greater customer retention, and increased sales. For BiC aerospace manufacturers, the most commonly reported improvement was in access to foreign markets, and for industrial electronic manufacturers it was in customer retention. For CPG manufacturers, it was in compliance processes.

BiC GSCM Processes and Technologies

To be successful at GSCM, BiC manufacturers are using many highly advanced processes and technologies — both at the corporate level and within their DCs and transportation operations (see Annex 1 for detailed BiC activities). Two of the most commonly used processes at the corporate level are joint process improvement and training on GSCM processes (Figure 8). Other common strategies include purchasing renewable energy (such as solar and wind power) and rewarding suppliers for their green practices.¹

FIGURE 8

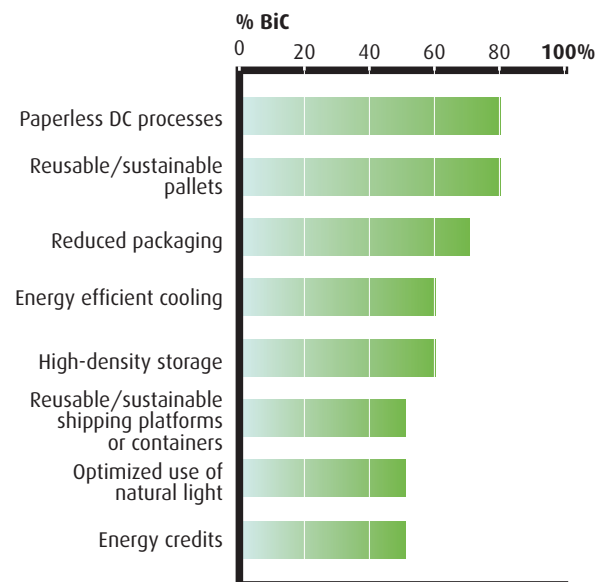
BiC processes used to implement GSCM practices in distribution activities¹



The most commonly used GSCM DC practices are paperless processes and reusable pallets, with 80% of BiC manufacturers implementing both. Reduced packaging and energy efficient cooling are also commonly used.¹ Other GSCM DC processes include high-density storage, optimized use of natural light, and energy credits (Figure 9). High-density storage is a system that maximizes the inventory stored in a given amount of space. An example is using stackable pallets that can be moved or accessed from a variety of points.

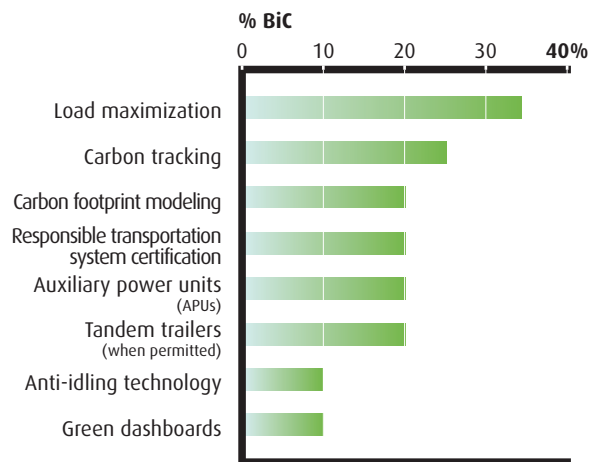
FIGURE 9

Distribution centre processes – BiC manufacturers¹



Fewer BiC manufacturers are using processes and technologies related to their transportation and logistics operations since 80% of their transportation volume is outsourced to service providers.³ The most commonly used processes by BiC manufacturers in their transportation operations is load maximization (35%), which is the optimization of pallet capacity in freight transportation (Figure 10).

FIGURE 10
Transportation technologies and processes – BiC manufacturers¹



Other GSCM technologies and processes that some BiC manufacturers are implementing include responsible transportation system certification, auxiliary power units, anti-idling technology, and green dashboards⁷ (computer units that track the carbon emissions produced by the vehicle). Responsible transportation system certification is awarded to transportation systems that have demonstrated environmentally friendly results verified by a non-government organization.

Final Remarks

GSCM presents a valuable set of activities for Canadian manufacturers. Companies that have adopted GSCM practices successfully have improved their business and environmental performance on many levels.

To benefit from productive GSCM practices, individual businesses should develop their own business cases. Canadian companies should not only make the business benefits of GSCM clear to their supply chain partners, shareholders, employees and senior management, but they should also make the environmental benefits of GSCM clear by developing metrics that are universally understood—for example, expressing carbon emission reductions as equivalent to “x” number of cars taken off the road or “y” number of trees saved. Each business case should include recommendations and a roadmap for implementing the proposed GSCM action plan. The roadmap exercise consists of documenting the long-term vision and classifying its components into specific actions linked to deliverables, performance indicators, objectives, return on investment, and the project time frame.

For some businesses, an initial roadmap action item could be to internally evaluate distribution activities and potential environmental improvements by participating in associations and networks. For others, the first step might be to implement a pilot project with a customer and a supplier, such as implementing a green energy and carbon emission reduction mandate, a recycling process or a GSCM scorecard system. In all cases, a well-documented roadmap allows businesses to gain the support and involvement of all stakeholders for the implementation of their GSCM action plan.

For policy makers, the findings presented in this report draw important linkages between the drivers for adopting GSCM practices, firm activities and resulting business benefits. These connections can help inform a continued dialogue across government and with stakeholders. This report also sets the stage for those interested in GSCM trends to pursue new research opportunities and projects.

References

1. Supply Chain & Logistics Association Canada, Green Supply Chain 2008 Survey, 2008
2. Supply Chain & Logistics Association Canada Research Committee, 2009
3. Canadian Supply Chain Sector Council, The Strategic Human Resources Study of the Supply Chain Sector, 2006



Annex I:

Best-in-Class Manufacturing Analysis – % of BiC

Automotive – BiC Business Benefits

Improvement	1–19%	20–50%
Differentiate services	20%	10%
Compliance	43%	20%
Risk management	29%	25%
Efficiency	29%	20%
Customer retention	43%	25%
Cost	43%	20%
Access to foreign markets	50%	25%
Increased sales	57%	10%

CPG – BiC Business Benefits

Improvement	1–19%	20–50%
Differentiate services	64%	18%
Compliance	80%	20%
Risk Management	80%	10%
Efficiency	90%	10%
Customer retention	70%	10%
Cost	73%	9%
Access to foreign markets	70%	10%
Increased sales	70%	10%

Aerospace – BiC Business Benefits

Improvement	1–19%	20–50%
Differentiate services	40%	10%
Compliance	40%	20%
Risk management	40%	30%
Efficiency	40%	30%
Customer retention	40%	30%
Cost	60%	20%
Access to foreign markets	50%	30%
Increased sales	60%	5%

Industrial Electronics – BiC Business Benefits

Improvement	1–19%	20–50%
Differentiate services	25%	20%
Compliance	25%	40%
Risk management	25%	40%
Efficiency	25%	30%
Customer retention	25%	75%
Cost	75%	25%
Access to foreign markets	25%	25%
Increased sales	50%	5%

† Supply Chain & Logistics Association Canada, Green Supply Chain 2008 Survey

Methods for Implementing GSCM Practices – BiC Manufacturers

	Manufacturing	CPG	Industrial Electronics	Automotive	Aerospace
Joint process improvement	90%	90%	85%	85%	80%
Training on green processes	80%	80%	75%	80%	80%
Purchase of renewable energy	75%	45%	100%	75%	85%
Investment in green initiatives in the community	70%	55%	55%	70%	60%
Rewarding of supplier practices	65%	45%	50%	70%	85%
Requirement of third-party certification for major suppliers	55%	30%	75%	70%	80%
Adoption of an internationally recognized reporting framework for performance on green parameters	40%	55%	50%	40%	45%

Transportation & Logistics Management Practices – BiC Manufacturers

	Manufacturing	CPG	Industrial Electronics	Automotive	Aerospace
Decreased use of air transportation	90%	90%	90%	90%	90%
Increased use of marine transportation	85%	65%	65%	86%	80%
Use of multi-modal transportation	80%	60%	60%	86%	85%
Use of environmentally responsible transportation/ logistics partners	80%	80%	65%	86%	90%
Decreased use of truck transportation	70%	55%	60%	80%	95%
Load maximization	35%	35%	25%	15%	-
Carbon tracking	25%	30%	25%	-	-
Carbon footprint modeling	20%	25%	25%	-	-
“Responsible” transportation system certification	20%	20%	25%	-	-
Auxiliary power units (APUs)	20%	30%	-	-	-
Tandem trailers (where permitted)	20%	20%	-	-	-
Anti-idling technology	10%	20%	25%	-	-

(-) = No result



Transportation & Logistics Management Practices – BiC Manufacturers (continued)

	Manufacturing	CPG	Industrial Electronics	Automotive	Aerospace
Green dashboards	10%	10%	25%	-	-
Speed governors	10%	10%	-	-	-
Compliant engines	10%	10%	-	-	-
Single-tire drive axles	10%	20%	-	-	-
Route optimization	10%	30%	-	-	-
Advanced lubricants	-	10%	-	-	-
Fleet management system	-	5%	-	-	-
Diesel/hybrid vehicles	-	5%	-	-	-
Vehicle tracking	-	5%	-	-	-

DC Corporate Practices – BiC Manufacturers

	Manufacturing	CPG	Industrial Electronics	Automotive	Aerospace
Paperless DC processes	80%	80%	75%	85%	80%
Reusable/sustainable pallets	80%	90%	75%	85%	80%
Reduced packaging	70%	55%	70%	80%	95%
Energy efficient cooling	60%	65%	100%	55%	80%
High-density storage	60%	60%	25%	45%	45%
Reusable/sustainable shipping platforms or containers	50%	55%	75%	55%	80%
Optimized use of natural light	50%	45%	90%	70%	80%
Energy credits	50%	45%	50%	70%	80%
Recycling of waste	50%	65%	25%	30%	40%
Optimized use of space through slotting	50%	55%	25%	45%	40%
LEED-certified facilities [‡]	50%	35%	50%	60%	60%
DC pick optimization	50%	75%	50%	30%	40%
Volatile organic compound-free materials/coatings	40%	30%	50%	40%	60%
Reverse logistics responsibility (disposal or recycling at product end of life)	40%	65%	25%	30%	40%
Dock seals and canopies	40%	50%	25%	45%	45%
Energy-efficient lighting	40%	80%	20%	15%	25%
Motion detector lights	40%	45%	50%	43%	65%
Alternative cooling systems	40%	35%	25%	29%	40%
Conveyer belt speed controls	40%	55%	40%	30%	10%
Low-volt conveyers	40%	75%	25%	40%	30%
Energy management control	40%	50%	50%	30%	20%

(-) = No result

[‡] LEED provides benchmarks for the design, construction and operation of a property and covers site makeup, building materials, water and energy efficiency as well as indoor environmental quality. It also provides certification for people who demonstrate an understanding of green building practices.

DC Corporate Practices – BiC Manufacturers (continued)

	Manufacturing	CPG	Industrial Electronics	Automotive	Aerospace
Cartonization (pallet configuration optimization)	30%	65%	20%	15%	10%
Alternative/efficient assets	30%	20%	50%	15%	60%
Recycled water	30%	35%	25%	20%	40%
Solar power	30%	30%	50%	25%	20%
Wind power	30%	25%	25%	43%	40%
Hydrogen fuel cell technology	30%	25%	30%	50%	20%

(-) = No result

