FLORIDA INTERNATIONAL UNIVERSITY
COLLEGE OF BUSINESS ADMINISTRATION
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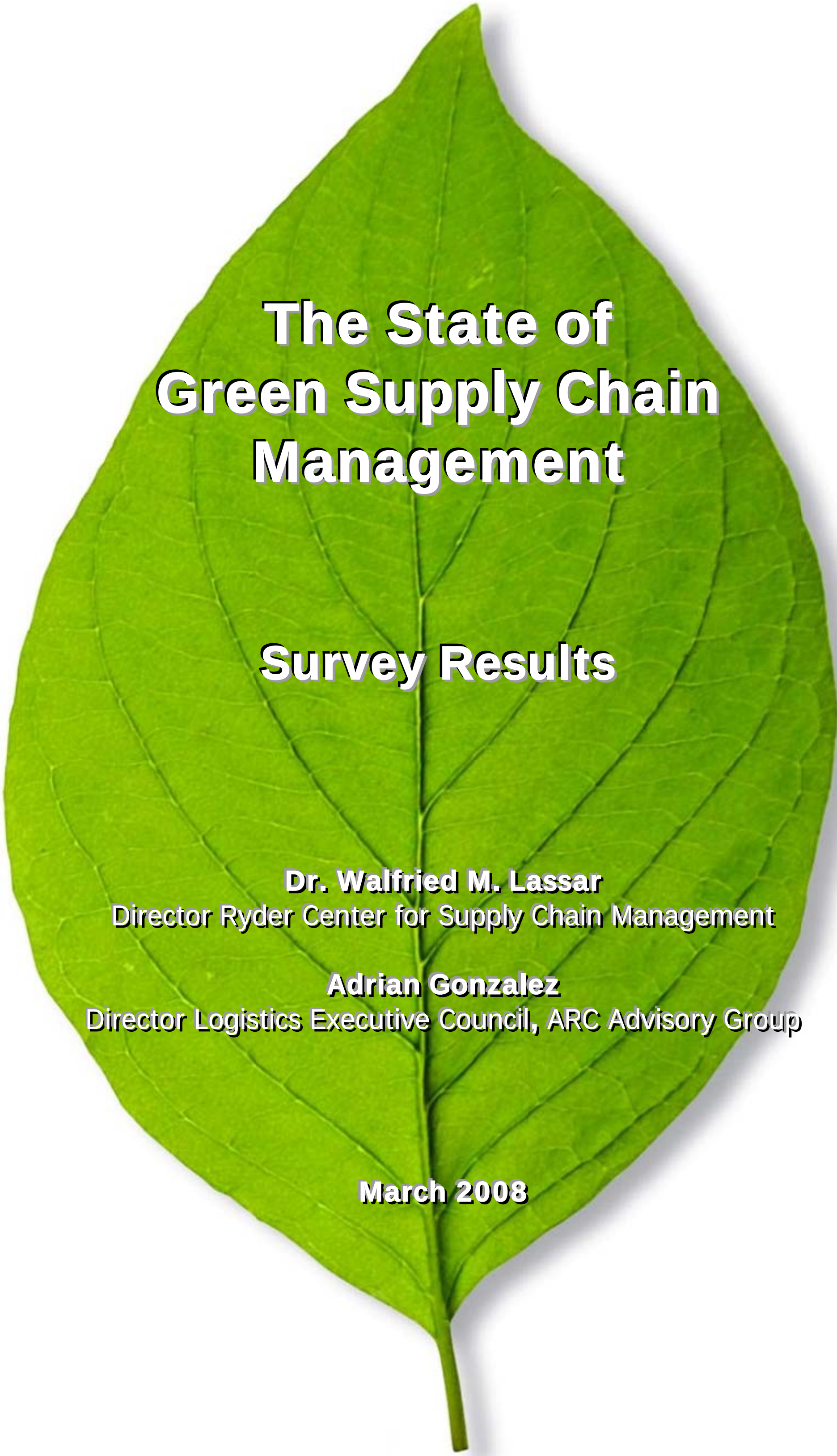
ARC Advisory Group



The State of Green Supply Chain Management

Survey Results

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I. Introduction

The environment, particularly global warming, is attracting considerable attention today from the media, academics, analysts, and the business community. The interests of business and the environment were historically viewed as incompatible, but that view is starting to change. Record oil and energy prices, for example, are spurring companies to optimize their transportation operations and reduce their energy consumption. Others are exploring ways to recycle more or reduce the amount of packaging in their products. "Green is good for business," is the new battle cry, a logical extension of Total Quality Management, Six Sigma, Lean, and other business practices.

But are we still in the 'early adopter' phase or is this trend more widespread? What types of "green" initiatives are companies prioritizing? What factors are driving companies to become more 'green'? Who manages these initiatives and how is success measured? Simply stated, what is the current state of Green Supply Chain Management?

The Ryder Center for Supply Chain Management at Florida International University, in collaboration with ARC Advisory Group, developed an online survey to answer these questions. This report summarizes and analyzes the key findings from the survey.

II. Survey Overview

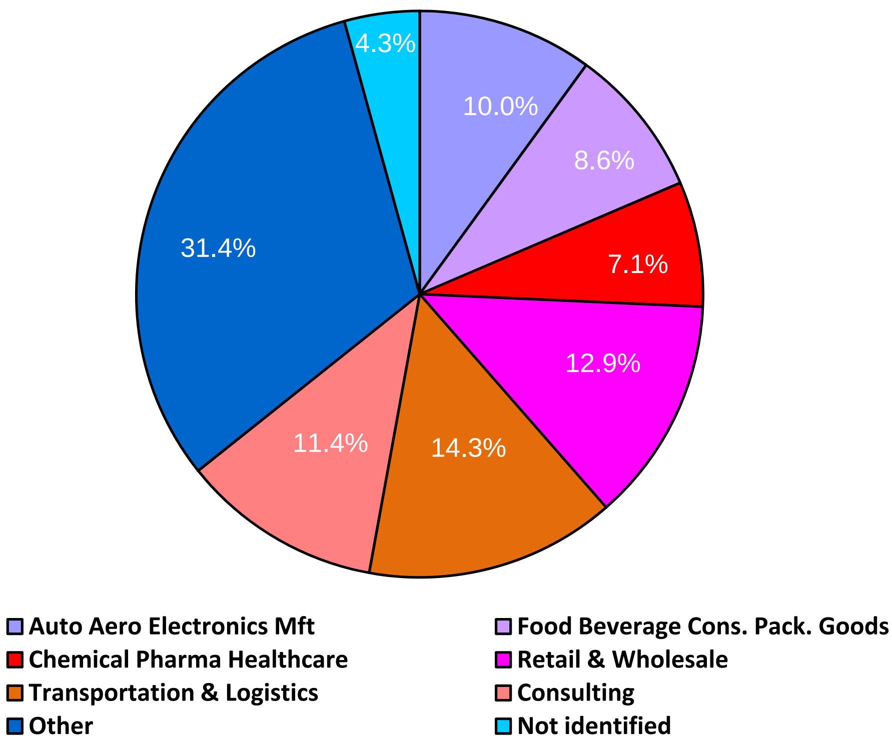
The online survey was posted in preparation for the Green Supply Chain Forum at Florida International University and was also open to external supply chain respondents. This survey can be found at http://rydercenter.fiu.edu/survey/greensc/greensc.htm where it remains open until April 30th, 2008. As of March 7, 2008, seventy supply chain professionals responded to the survey. These executives came from a cross-section of companies ranging from <$50 million to >$1 Billion in sales and operating in various industry verticals.

Respondents were asked a number of questions to establish the key drivers for green supply chain efforts, as well as the benefits and risks involved.

III. Profile of Respondents

14% of the respondents are in the **Transportation & Logistics** service sector and 39% are from **Manufacturing & Retailing**. The remaining 47% of respondents came from firms in Other Industries including Services and 4% of the respondents did not identify their industry.

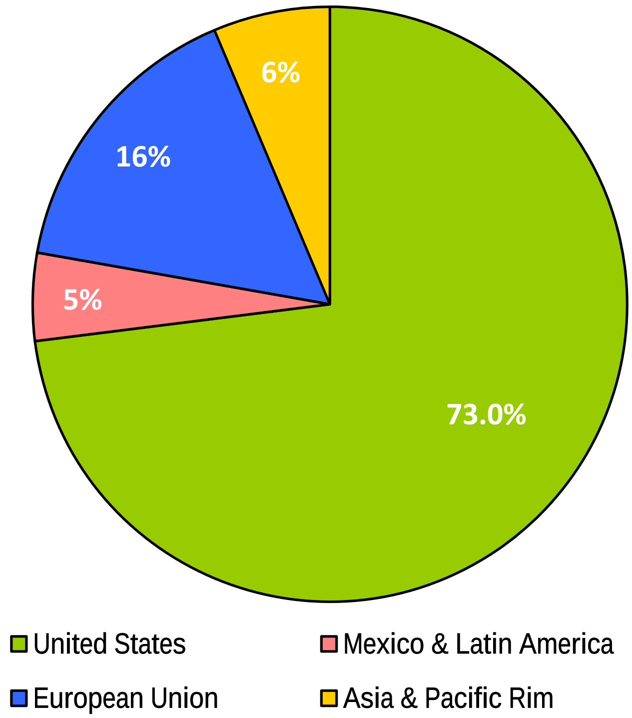
Figure 1: Firm Profile for Respondents



Industry representation is fairly evenly distributed for our sample indicating the wide range of interest in this emerging management concern.

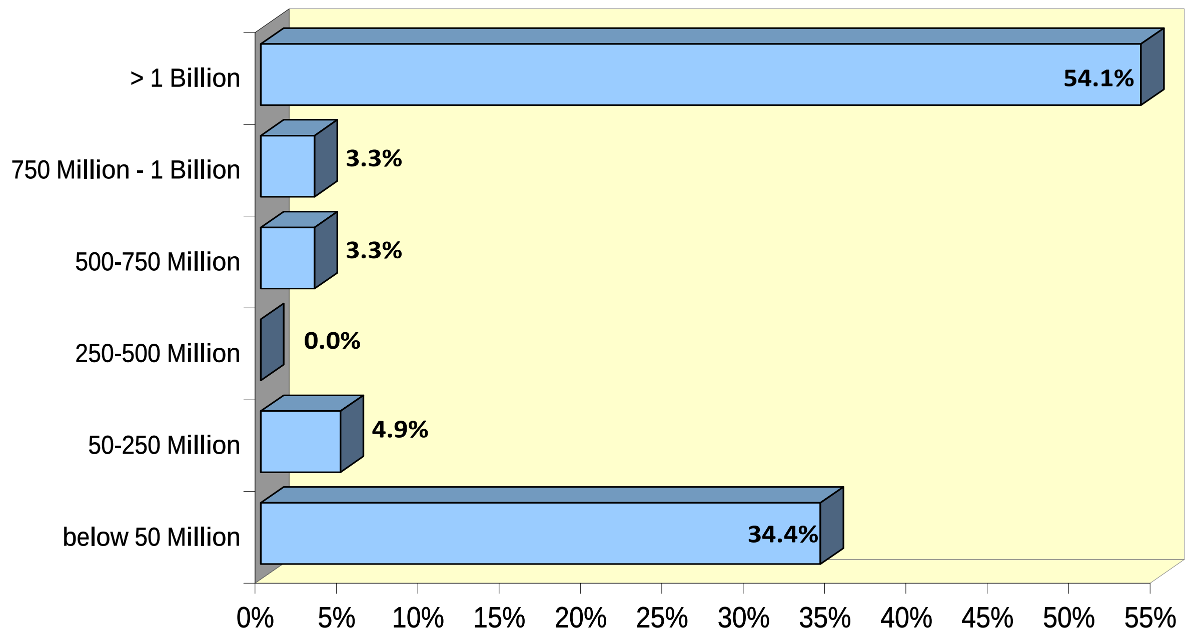
Almost three quarters of the respondents work for companies headquartered in the United States, while 16% are from European companies and 6% from Asia/Pacific companies. This breakdown reflects the survey's focus on the US market. Nonetheless, the relatively high response rate from US firms is further evidence that Green Supply Chain Management is gaining importance in the US.

Figure 2: Firm Headquarters



The sample has a heavy bi-modal distribution. Fifty-four percent of our sample are very large companies with revenues of $1 Billion and thirty-three percent are smaller companies with revenues below $50 Million. This indicates a heavy interest of small and large companies in how to address the new business challenges caused by sustainability issues. The lack of representation in the middle market is surprising.

Figure 3: Revenue Profile



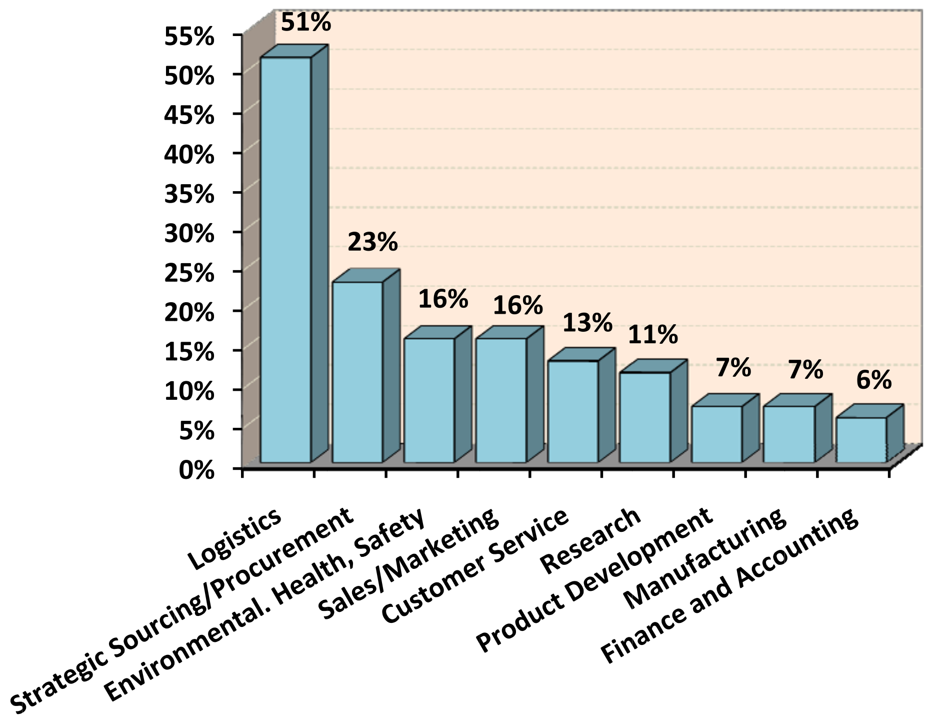
Filtering the data by industry shows that almost two-thirds of the large companies are in the Manufacturing & Retail sector, while one-third of the small companies are Transportation & Logistics firms. The fact that most early adopters of "green" supply chain practices in Manufacturing & Retail are large companies, and that most Transportation & Logistics companies, as well as consultants, are small businesses, helps to explain the bi-modal distribution

Table 1: Industry by Adjusted Revenue [% of Answers]

Industry	Revenue Small Co	Revenue Medium Co	Revenue Large Co	Total
Auto Aero Electronics Mft			21.2	11.5
Food Beverage Cons. Pack. Goods		14.3	15.2	9.8
Chemical Pharma Healthcare	4.8	14.3	9.1	8.2
Retail & Wholesale		28.6	18.2	13.1
Transportation & Logistics	33.3	14.3	6.1	16.4
Consulting	23.8	14.3	6.1	13.1
Other	38.1	14.3	24.2	27.9
Total	100.0	100.0	100.0	100.0

More than half of our survey respondents hold functional responsibilities in Logistics and about a quarter are responsible for Procurement. While 16% have Environmental, Health, and Safety responsibilities, it is surprising that only 7% have Manufacturing responsibilities. Then again, although Manufacturing is generally recognized as a critical component of Supply Chain Management, it has traditionally been managed separately from an organizational standpoint. The data suggests this separation persists.

Figure 4: Functional Responsibilities



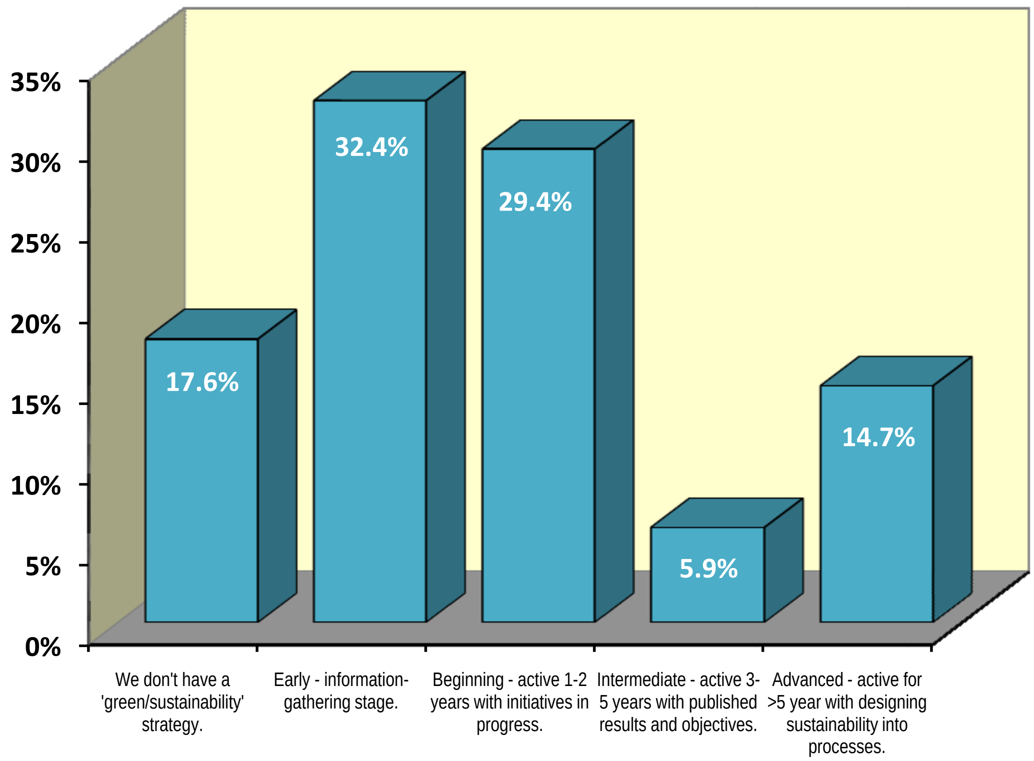
In regard to scope of respondents' responsibilities, 54.3% have local, 22.9% have regional to international, and 12.9% have global responsibilities. Clearly, the focus of our sample is on the US market.

32.9% percent of our sample holds Manager titles, followed closely by Directors with 25.7%. C-Level executives represent 7.1% of our sample and Vice-Presidents 5.7%. The remaining sample either has other titles (18.6%) or did not answer the question. However, our sample clearly shows that the survey was answered by corporate leaders with responsibilities across multiple functional groups.

IV. State of Companies' 'Green'/Sustainability Activities

Over 50% of the firms participating in this survey are either don't have a "green" strategy or are in the early stages, while about 21% consider themselves in the intermediate or advanced stage. This implies that we are still in the "early adopter" phase.

Figure 5: State of Green Activities



A more differentiated picture emerges when we compare the stage of "green" activity by company size. We see that almost 40% of small companies (less than $50 million in revenues) don't have green activities at all, while a quarter of large companies (over $1 billion in revenues) are already in the Advanced stage. Mid-sized companies fall somewhere in the middle, with almost 86% in the Early or Beginning stages. These results further indicate the "early adopter" phase of this movement, where large companies tend to lead the way, mid-sized companies are fast followers, and small companies lag behind.

Figure 6: State of Green Activities by Firm Size (Revenue)

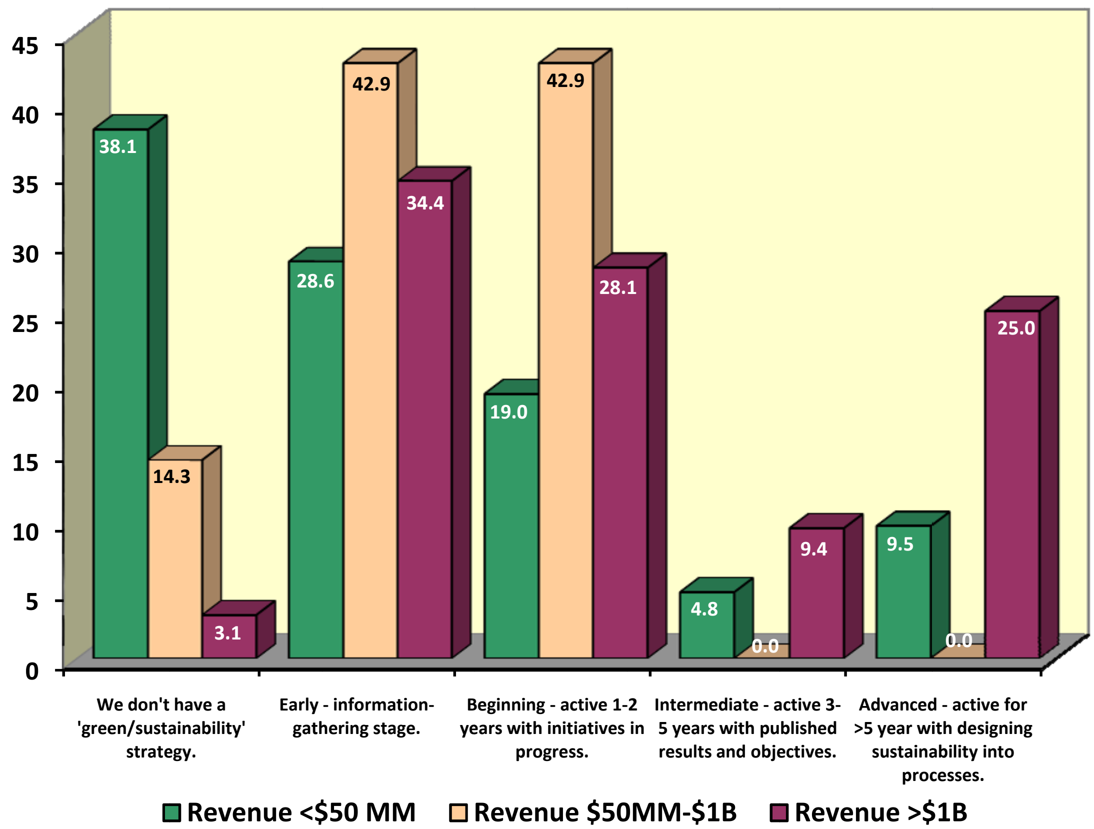


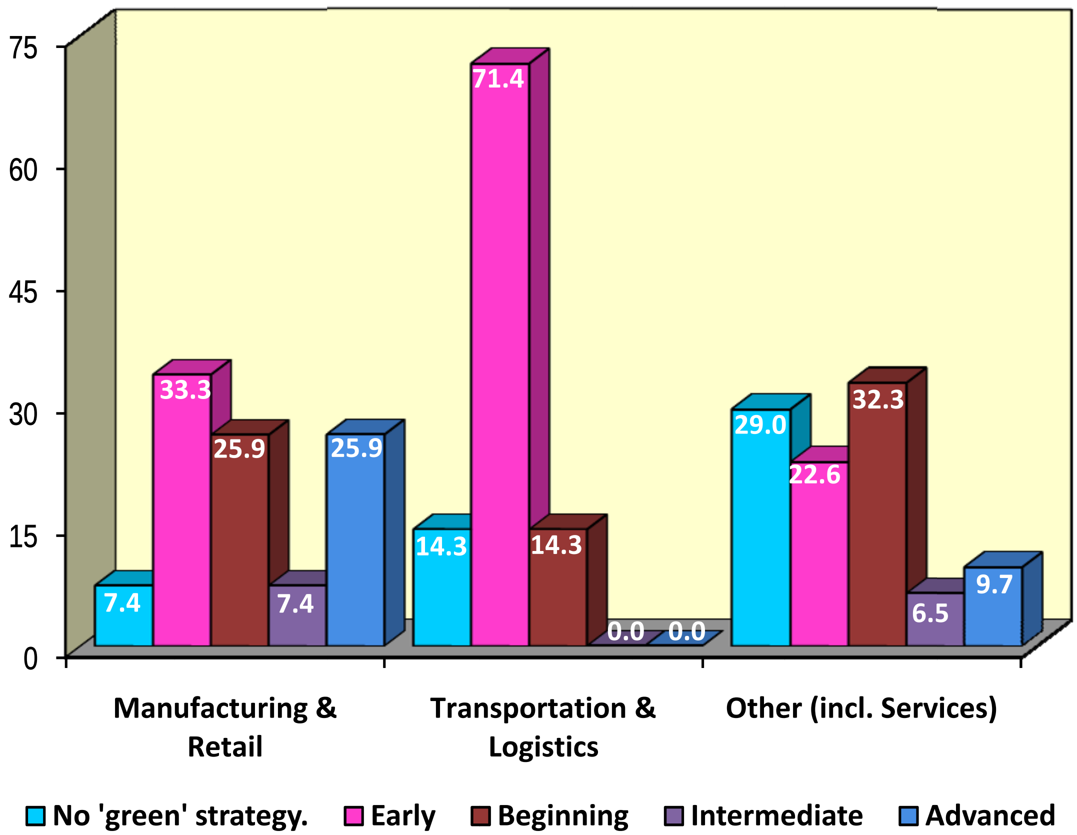
Table 2: State of your company's green/sustainability activities by company revenue

	Revenue <$50 MM	Revenue $50MM-$1B	Revenue >$1B
We don't have a 'green/sustainability' strategy.	38.1	14.3	3.1
Early (information-gathering stage, no formal corporate sustainability statement or report).	28.6	42.9	34.4
Beginning (active 1-2 years, defined/documented sustainability statement, initiatives in progress).	19.0	42.9	28.1
Intermediate (active 3-5 years, published results and objectives, active with external groups).	4.8	0.0	9.4
Advanced (active for >5 years, designing sustainability into products and supply chain processes).	9.5	0.0	25.0

Note: Cells show % excluding missing observations

Looking at the analysis by industry, we see that the Manufacturing & Retail sector is more advanced than the Transportation & Logistics sector when it comes to green activities. 85% of the Transportation & Logistics sector is either in the early stage or does not have a green strategy yet, while about 60% of the Manufacturing & Retail sectors are already past the early stage. This data suggests, along with other research findings, that Transportation & Logistics service companies are generally getting "pulled into" green activities by their customers, namely Manufacturers & Retailers.

Figure 7: State of Green Activities by Industry



V. Analysis of "Green' Efforts

When asked: "Which green/sustainability projects is your company undertaking?" Carbon footprint reduction in transportation is the top "green"/sustainability project companies are undertaking, mentioned by 57% of the respondents. Recycling of products or scrap material and reduction in energy consumption was also mentioned by more than fifty percent of the respondents. Reducing the carbon footprint of their overall supply chain network was also in the top five. Elimination of hazardous materials in products and manufacturing processes was mentioned about 27% and 21%, respectively. Surprisingly, the reduction of waste, either in packaging or manufacturing, showed very different results; reduction of packaging was mentioned 45% of the time while manufacturing waste reduction was mentioned by only 21% of the respondents.

Table 3: Green/Sustainability Projects

'Green'/sustainability projects	Check All	Top 3
Optimize transportation operations to reduce carbon footprint	57.10%	51.40%
Recycle returned products or scrap material	57.10%	38.60%
Reduce energy consumption in manufacturing and buildings	54.30%	45.70%
Reduce packaging	45.70%	25.70%
Redesign supply chain network to reduce carbon footprint	30.00%	20.00%
Increase use of renewable energy sources (e.g. solar, wind)	27.10%	18.60%
Eliminate/reduce hazardous/toxic materials from products	27.10%	12.90%
Eliminate, reduce, or repurpose manufacturing waste	24.30%	11.40%
Eliminate/reduce hazardous/toxic chemicals from manufacturing processes	21.40%	11.40%
Implement Design for Environment practices in product development	18.60%	11.40%
Other	10.00%	8.60%

Not much activity is taking place to implement 'Design for Environment' practices in product development or to eliminate/reduce hazardous or toxic chemicals from manufacturing processes. There could be two possible reasons: (1) these initiatives may require more time and investment (long payback period) than other types of initiatives; and (2) most survey respondents may not be fully aware of the initiatives taking place in product development and manufacturing, since only about 7% of the respondents have responsibility in these areas.

Overall, it appears that companies are tackling the 'low hanging fruit' first, either activities that are already part of standard practices, such as optimizing transportation, or activities that are reactionary responses to acute problems, such as escalating fuel and energy prices.

When it comes to cooperation with external parties, working with suppliers on green supply chain activities dominates. Another interesting finding, although not completely surprising: only 3 respondents reported working with competitors, and 35 said they have no plans to engage with them. This is not the unified approach that is talked about in industry circles! It also suggests that achieving standard metric definitions and measurement methodologies for green and sustainability activities will not happen quickly or easily, even at the industry level.

Figure 8: External Cooperation on Green Efforts

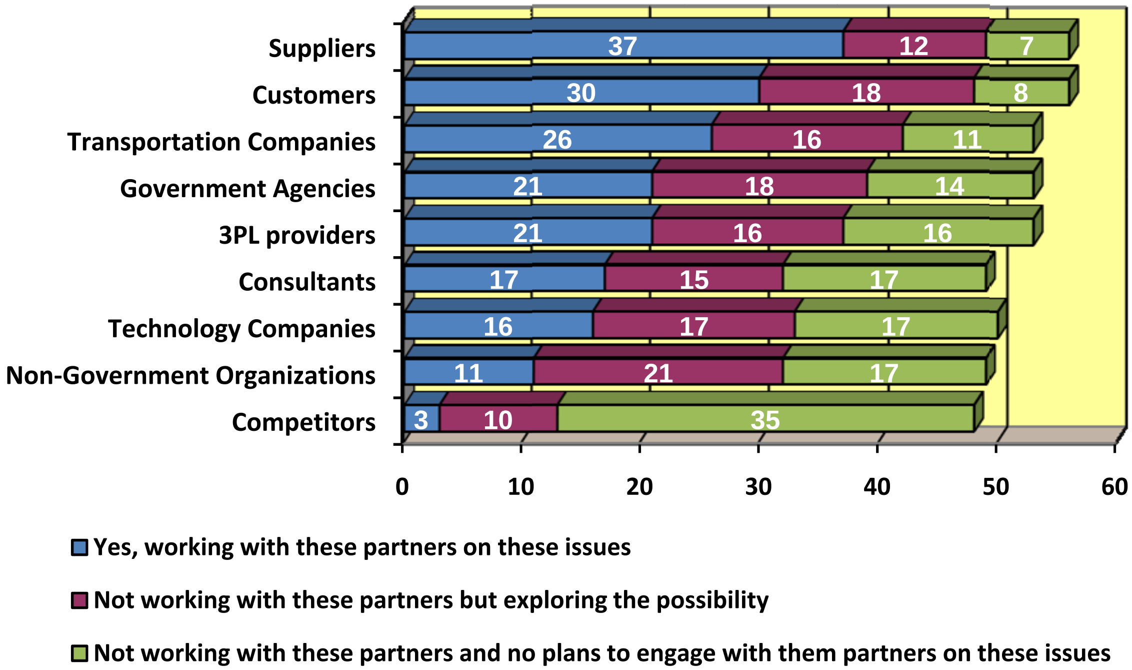


Table 4: Which of the following external parties are you working with on green/sustainability initiatives? [Number of respondents]

	Yes, working with these partners on these issues	Not working with these partners but exploring the possibility	Not working with these partners and no plans to engage with them on these issues
Competitors	3	10	35
Non-Government Organizations (e.g. Carbon Disclosure Project)	11	21	17
Technology Companies	16	17	17
Consultants	17	15	17
Third Party Logistics (3PL) providers	21	16	16
Government Agencies (e.g. Environmental Protection Agency)	21	18	14
Transportation Companies	26	16	11
Customers	30	18	8
Suppliers	37	12	7

Almost 40% of the 56 firms that are active with green activities do not have any metrics to measure green/sustainability results in their firms. These results indicate that standard metrics do not yet exist or are still being developed in this area. It also raises serious questions about how well companies can actually manage their green/ sustainability projects if they can't establish a baseline and measure progress. Metrics for packaging and energy consumption are the most common. These metrics coincide with the top green/sustainability projects companies are doing, as shown previously in Table 2.

Figure 9: Green/Sustainability Metrics by State of Green Initiatives [Observations]

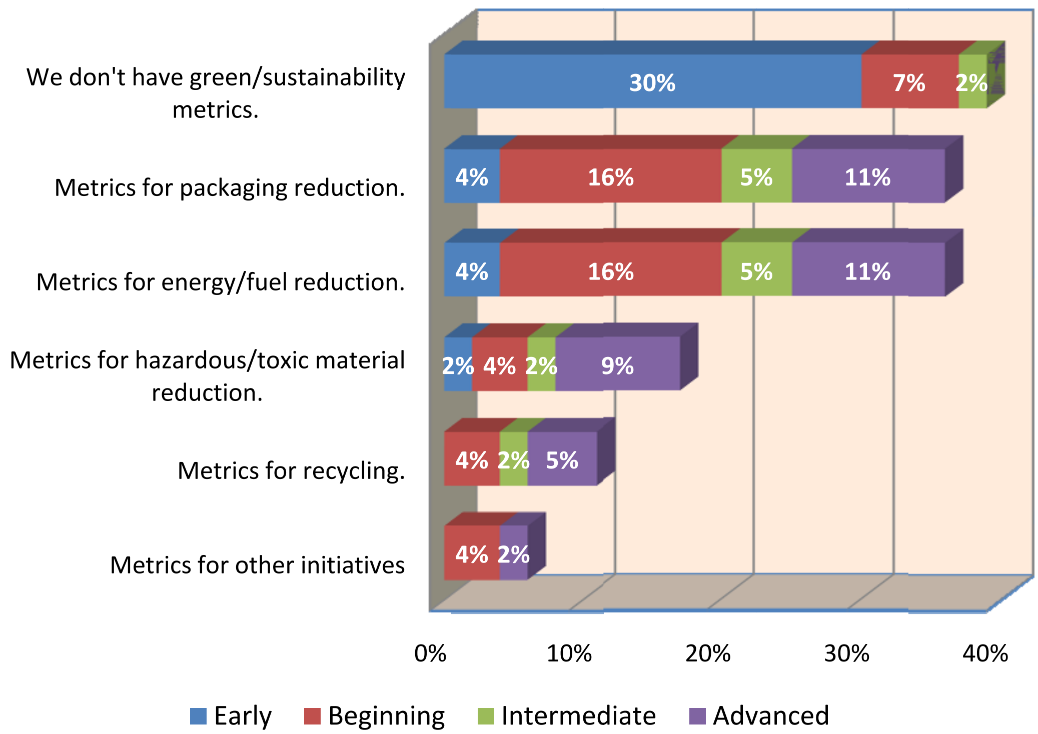
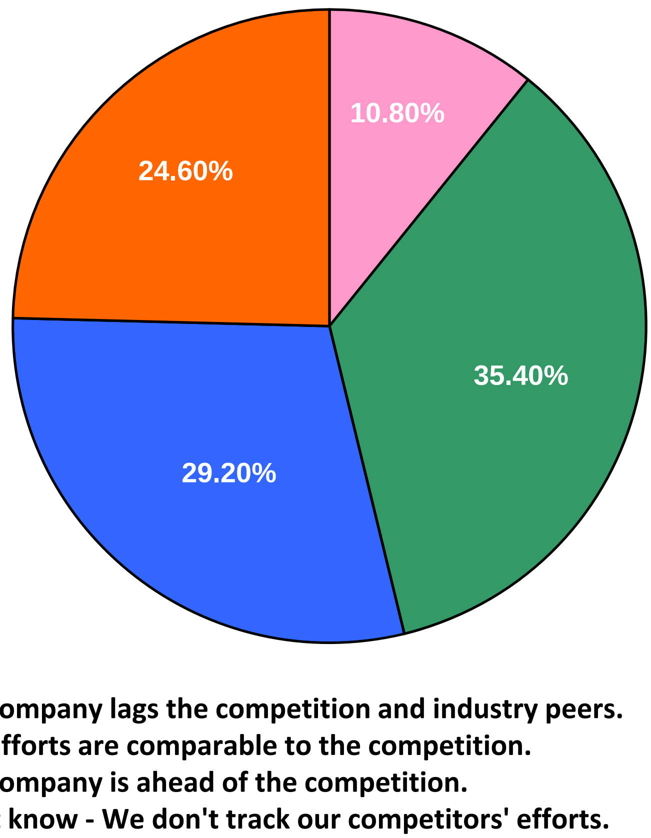


Table 5: Green/Sustainability Metrics by State of Green Initiatives [%]

How would you characterize the state of your company's green/sustainability activities?	Early	Beginning	Intermediate	Advanced	Total
Metrics for other initiatives	0%	4%	0%	2%	5%
Metrics for recycling.	0%	4%	2%	5%	11%
Metrics for hazardous/toxic material reduction.	2%	4%	2%	9%	16%
Metrics for energy/fuel reduction.	4%	16%	5%	11%	36%
Metrics for packaging reduction.	4%	16%	5%	11%	36%
We don't have green/sustainability metrics.	30%	7%	2%	0%	39%

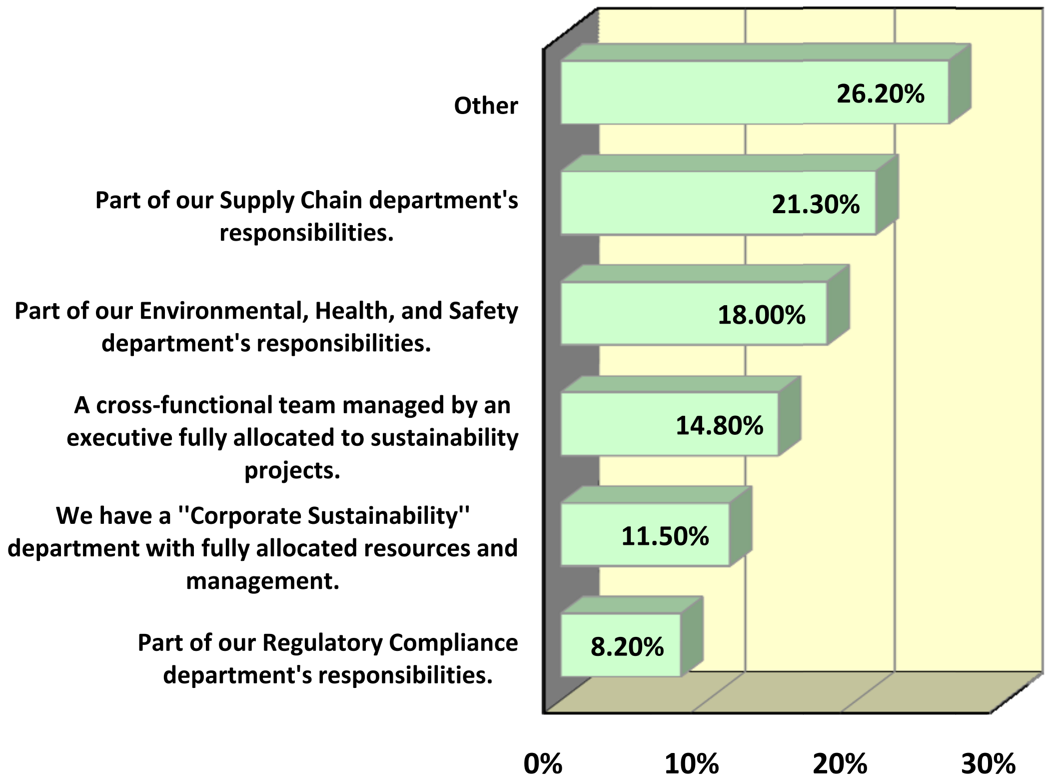
More than a third of the firms responding to the survey either did not track their competitors or felt that they are lagging their competition and industry peers in regard to green activities. These numbers reflect the fact that, as the previous page highlights; many companies lack the metrics to adequately understand the scope and progress of their sustainability activities. If companies are unclear about what they're doing internally, how can they compare themselves against other firms? Then again, almost two thirds of our sample felt that their companies were at least on par with their competition in regards to green activities. These results are more likely based on perception than actual benchmark data.

Figure 10: Benchmarking Green Efforts against Competition



Green efforts are mainly run out of the Supply Chain Management department, followed by Environmental, Health, and Safety departments and cross-functional teams. Simply stated, companies are managing sustainability efforts in a variety of ways, and no single approach is dominant at this time (another indicator that we're still in the 'early adopter' phase).

Figure 11: Responsibility for Green Efforts



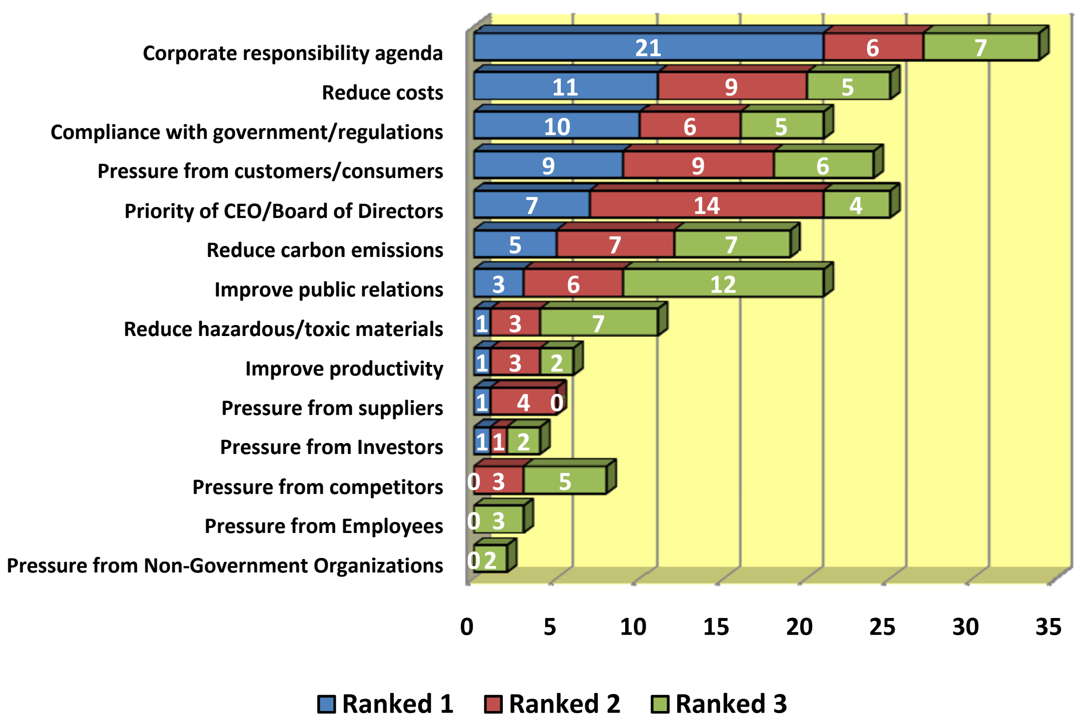
Note: Under 'OTHER' the following was mentioned:

Marketing Initiative
Committee Members with other full time jobs
Ad hoc projects across a wide range of disciplines
Through a Green Committee
General Corporate Mandate but still not down to the trenches
We have formed a Green Committee with executive sponsorship as part of our first steps
Conservation dept and operations
Informally by a group of interested consultants
Lead by EH&S department with engagement across the company
This is a newly registered company
Our Customer base interest in embedding GHG Modeling in our software
My company is owner operated…I strive to continually educate myself on sustainability implementation
Has yet to be defined
Customer mandated, and defined by the customer (major retailers).

VI. Key Drivers for "Green" Activities

A detailed analysis of the reasons why companies engage in green activities was developed by asking the question: "Please rank, in order of importance, the top 3 reasons your company is active with green/sustainability initiatives?" The response was surprising.

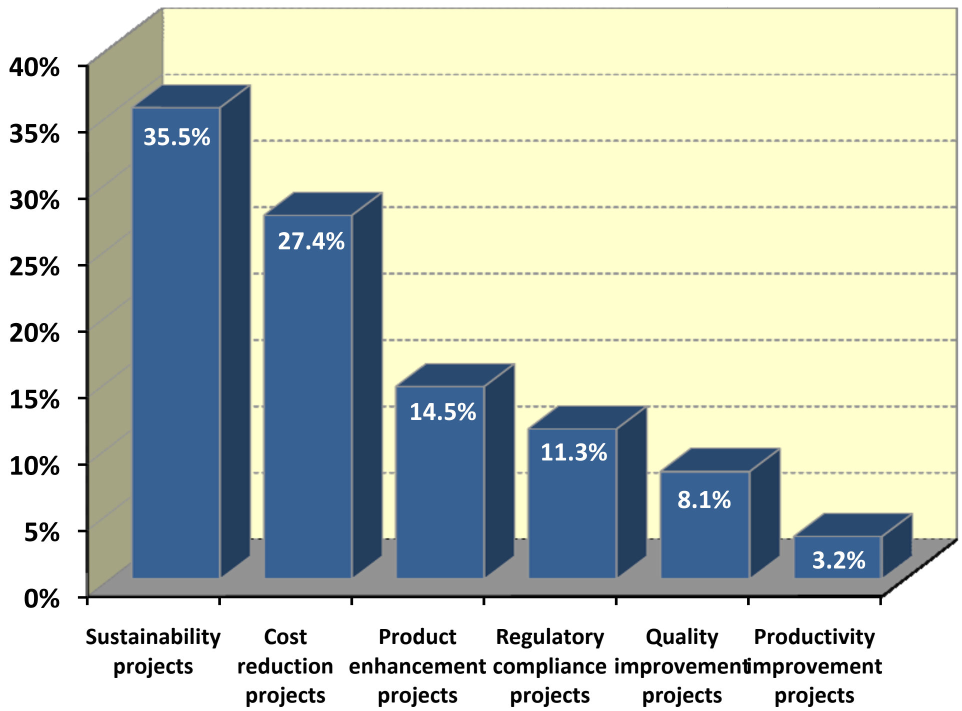
Figure 12: Green Activity Key Drivers



It shows that corporate leaders have grasped the importance of sustainability and are setting the agenda. It also shows that compliance with regulations and pressure from customers are also strong forces in getting companies to act. The analysis reveals that green supply chain management has moved beyond isolated pressure points and is driven by a combination of regulatory and market forces that have caused corporate leadership to take notice.

When asked: "Which statement best characterizes the primary justification of your company's green/sustainability projects?" more than a third of the respondents chose *Sustainability/environmental-improvement projects that as a byproduct have a cost or productivity benefit.* The second most important justification for green projects was *Cost reduction projects that as a byproduct benefit the environment* listed by about a quarter of the respondents. The combinations of environmental efforts that are synergetic with cost reduction dominate the justification for green activities at about 60%. This result lends support to the "green is good for business" perspective many companies are taking when justifying green initiatives.

Figure 13: Justification for Green Efforts



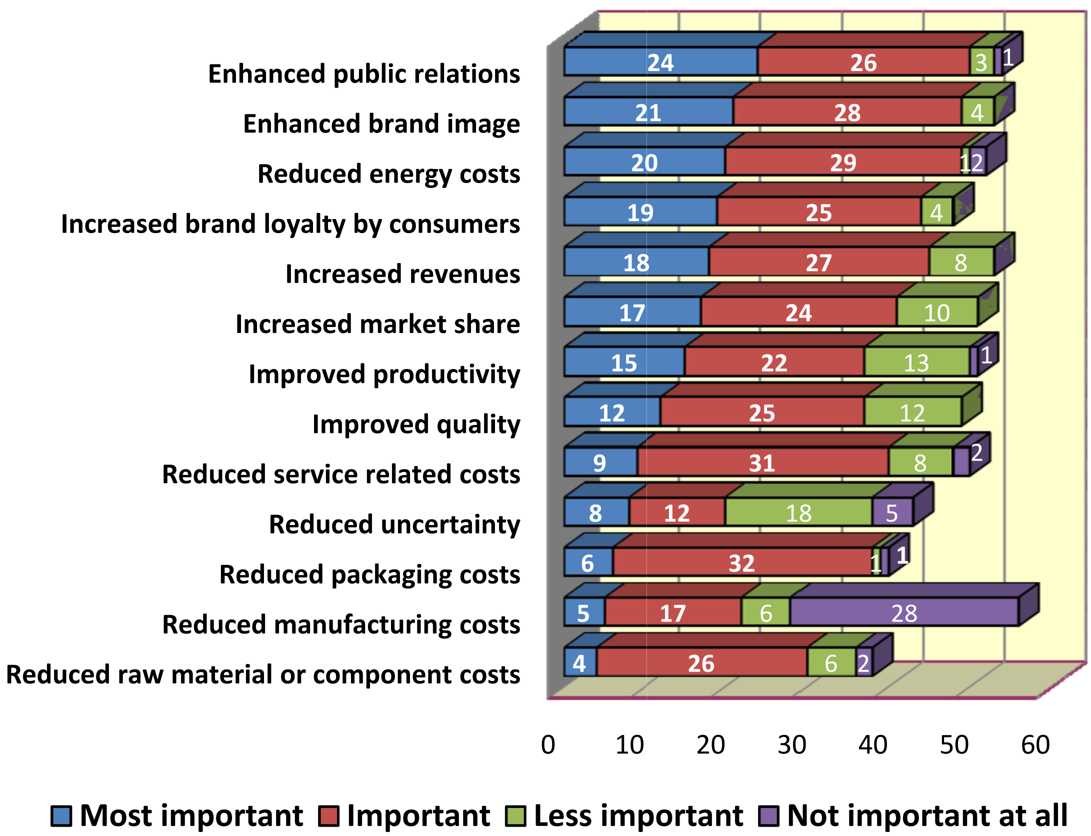
Note: Complete statements for categories are as follows

1. Sustainability/environmental-improvement projects that as a byproduct have a cost or productivity benefit.
2. Cost reduction projects that as a byproduct benefit the environment.
3. Product enhancement projects that as a byproduct benefit the environment.
4. Regulatory or mandate compliance projects that as a byproduct benefit the environment and/or improve costs, productivity, and/or quality.
5. Quality improvement projects that as a byproduct benefit the environment.
6. Productivity improvement projects that as a byproduct benefit the environment.

VII. Benefits and Expectations for the Future

Four of the top five expected benefits generated by green activities are external market oriented benefits. The top two benefits that rate either most important or important are enhanced public relations (50 out 57 mentions) and enhanced brand image (49 out of 57 mentions). The third is reduced energy costs (49 out of 57 mentions) followed by increased consumer loyalty and revenues (44 and 45 mentions, respectively).

Figure 14: Expected Benefits generated by Green Efforts



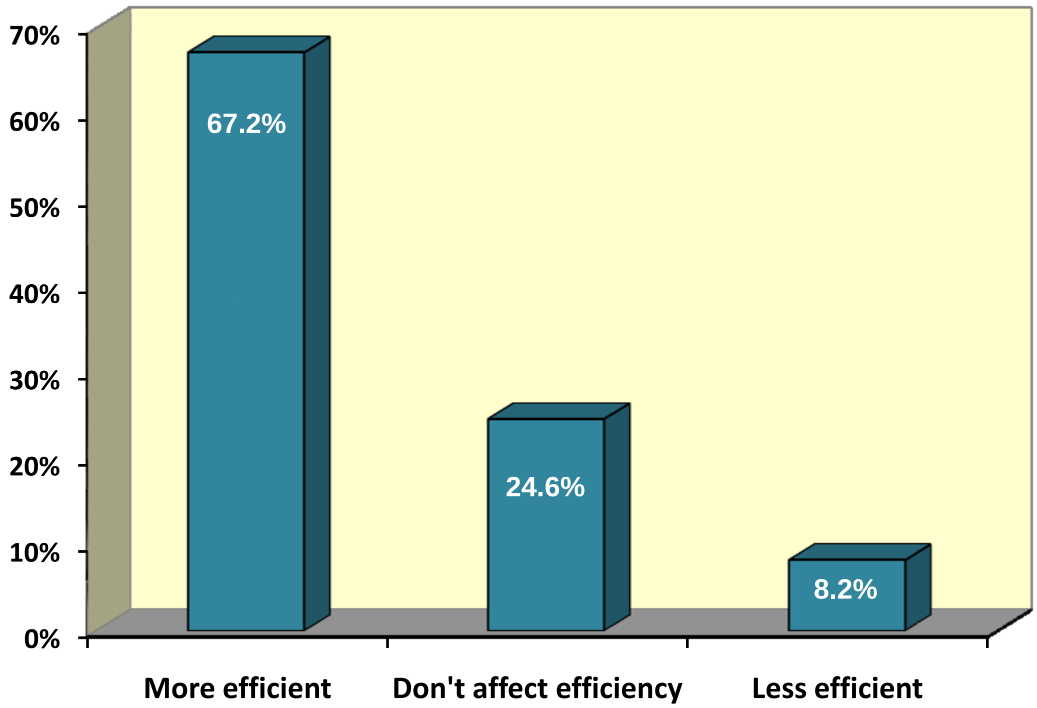
When filtered by industry the results are even more interesting. Only 16% of the respondents working in the Food, Beverage, Consumer Packaged Goods industry see brand image as the most important benefit and instead focus on energy savings at (almost 67% mentioned it as the most important benefit). Retail and Wholesale representatives share that view and 75% of the respondents mentioned energy savings as the most important benefit. Transportation and logistics companies expect increased revenues (55%) and consultants clearly focus on brand image and public relations as the most important benefit (71% and 57%, respectively) for their business.

Table 6 - Benefits derived from going 'Green' by Industry Category

			Industry						
			Auto Aero Electronics Mft	Food Beverage Cons. Pack. Goods	Chemical Pharma Healthcare	Retail & Wholesale	Transport & Logistics	Consulting	Other
Enhanced public relations	Most important	n	3	2	1	4	3	4	7
		%	42.9	40.0	25.0	50.0	33.3	57.1	41.2
	Important	n	3	2	3	3	5	2	8
		%	42.9	40.0	75.0	37.5	55.6	28.6	47.1
Enhanced brand image	Most important	n	2	1	0	3	3	5	7
		%	33.3	16.7	0.0	37.5	37.5	71.4	41.2
	Important	n	4	2	4	3	5	2	8
		%	66.7	33.3	100.0	37.5	62.5	28.6	47.1
Reduced energy costs	Most important	n	2	4	1	6	1	1	5
		%	28.6	66.7	25.0	75.0	12.5	12.5	31.3
	Important	n	4	2	2	2	4	5	10
		%	57.1	33.3	50.0	25.0	50.0	62.5	62.5
Increased brand loyalty by consumers	Most important	n	1	1	0	3	3	5	6
		%	16.7	20.0	0.0	37.5	37.5	71.4	35.3
	Important	n	3	3	3	3	4	1	8
		%	50.0	60.0	100.0	37.5	50.0	14.3	47.1
Increased revenues	Most important	n	0	2	1	4	5	2	4
		%	0.0	40.0	33.3	50.0	55.6	28.6	23.5
	Important	n	4	2	1	3	4	4	9
		%	66.7	40.0	33.3	37.5	44.4	57.1	52.9

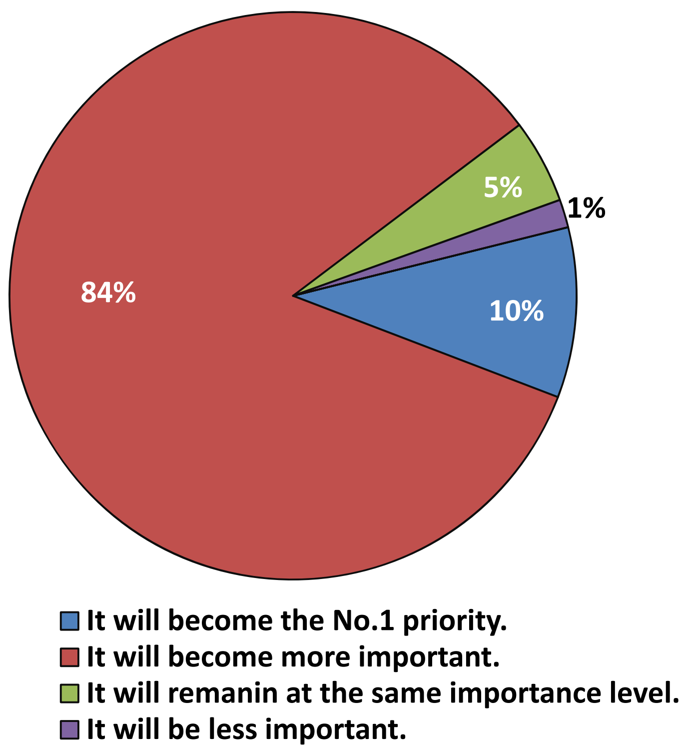
When asked: "In your opinion, green supply chain initiatives make our supply chain More efficient, Don't affect efficiency, or Less efficient?" two thirds of all respondents think that overall supply chain management will become more efficient due to green efforts. This provides further evidence that the industry expects bottom line results from the sustainability efforts.

Figure 15: Efficiency Assessment on Green Supply Chain Initiatives



When asked: “Do you expect a change of importance of green transportation and logistics issues over the next three years?” 83% of the respondents felt that it will increase in importance, while only 10% expect it to rise to #1 priority. No respondent thought of it as a trendy “fad” and only one respondent thought it may decrease in importance.

Figure 16: Change of Importance on Green Transportation/Logistics Issues



A more differentiated picture emerges when we filter the previous responses by company size and industry respectively. We see that almost 50% of medium sized companies are convinced that green supply chain management will become their top priority. Not surprisingly 25% of consulting firms believe that green issues will become their top priorities in the next 3 years, reflecting the overall importance of the topic and its impact on their consulting work. Surprisingly, only in the Chemical, Pharma and Healthcare sector do we find a significant percentage of respondents to identify green issues as top priority. As expected, none of the respondents thought green issues will lose importance.

Table 7 - Importance of Green Transportation and Logistics Issues
by Company Size and by Industry

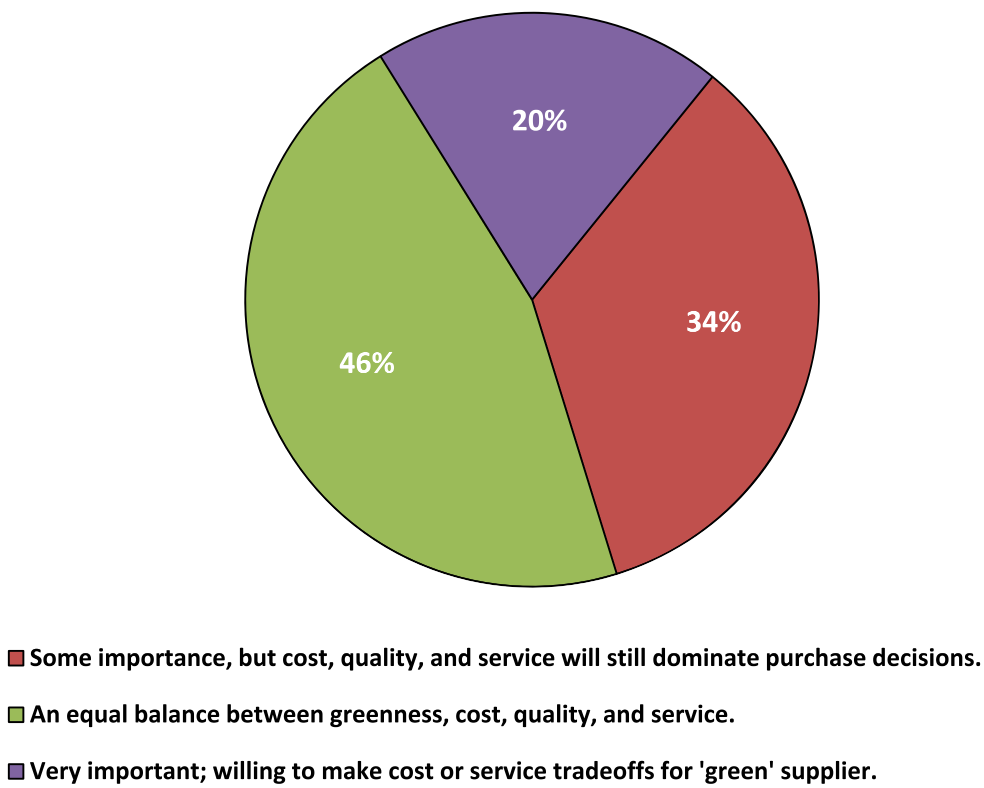
Do you expect a change of importance of green transportation and logistics issues over the next three years?

	It will become the No.1 priority.	It will become more important.	It will remain at the same importance level.	It will be less important.
Company Size [%]				
Small Co	5.00	90.00	5.00	
Medium Co	**42.86**	57.14		
Large Co	6.45	83.87	6.45	3.23
Industry [% within Industry]				
Auto - Aero - Electronics Mft		71.43	14.29	14.29
Food - Beverage - Cons. Pack. Goods		100.00		
Chemical - Pharma - Healthcare	**20.00**	80.00		
Retail & Wholesale	12.50	87.50		
Transportation & Logistics	10.00	80.00	10.00	
Consulting	**25.00**	75.00		
Other	5.88	88.24	5.88	

One of the most surprising results were derived from questions about consumer attitudes.

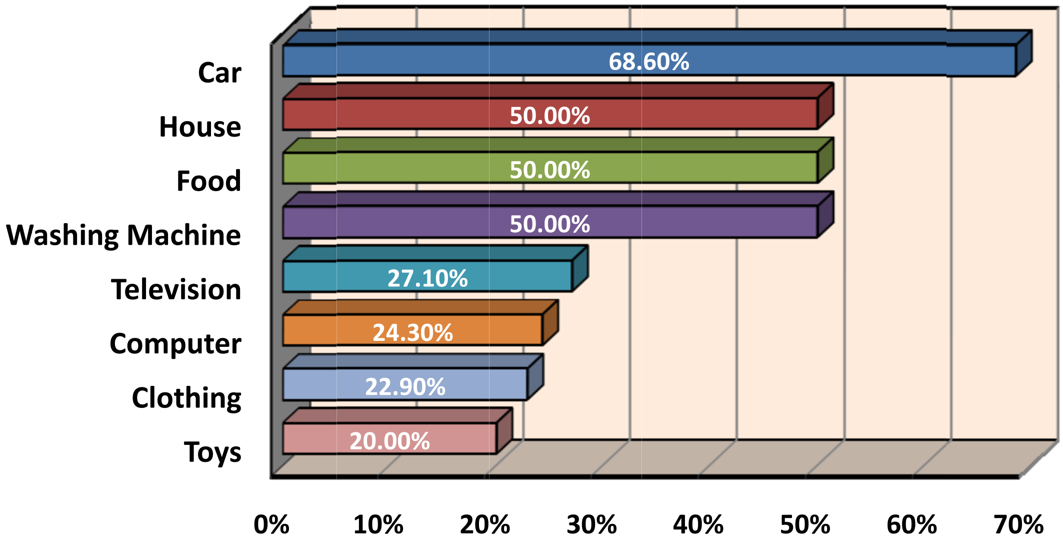
When asked: “In five years, how much importance do you believe customers/consumers will place on ‘greenness’ when making purchasing decisions?” two fifth off all respondent still look at sustainability efforts as taking a backseat to or being just one part within the tradeoff system of cost, quality and service. In other words, while companies expect a halo effect from the green effort when it comes to brand equity and public relations issues, firms are well aware of the fact that end customers will demand ‘greenness’ within the current market value system.

Figure 17: Importance of Greenness in Consumer Purchasing Decisions



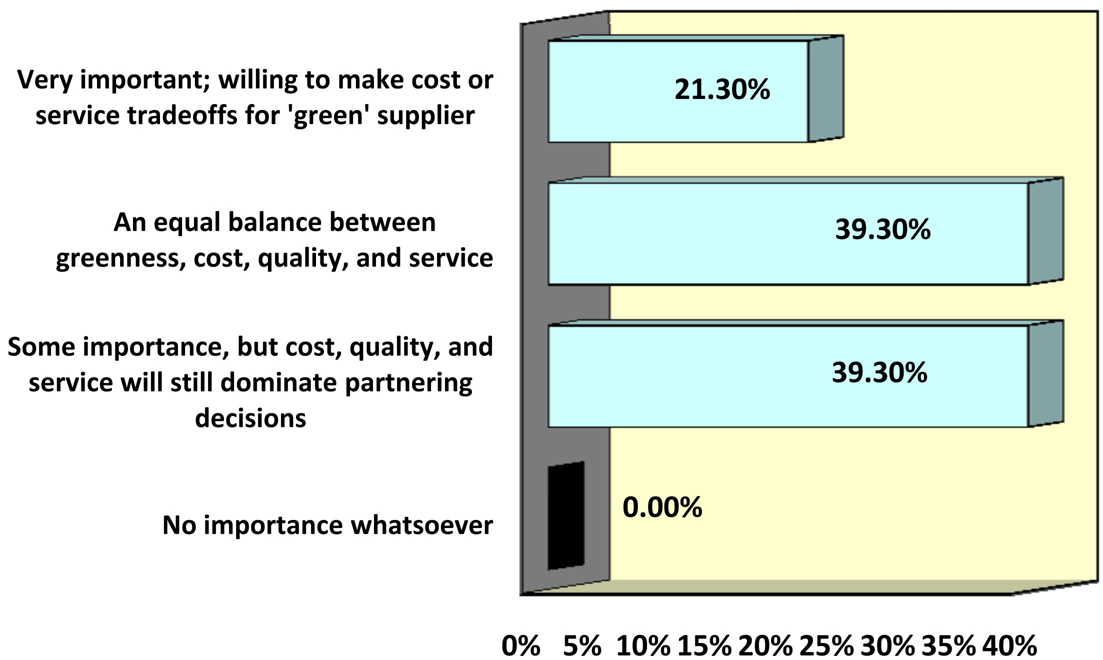
We then asked managers to speculate on consumer willingness to spend more for ‘green’ products and services with the question: “As a Consumer, which of the following products would you pay 10% more for an ''environmentally-friendly'' option? Mark all that apply.” The two big ticket items in family purchases, house and car are at the top of the list. Food and Washing Machines follow. Respondents expect only about a quarter of all consumers or less to willingly spend 10% more for electronics, clothing and toys.

Figure 18: Environment Friendly Option



We then turned our attention to business to business relationships with the question: "In five years, how much importance will companies place on greenness/ sustainability when selecting suppliers?"

Figure 19: Importance of Greenness in Selecting Suppliers

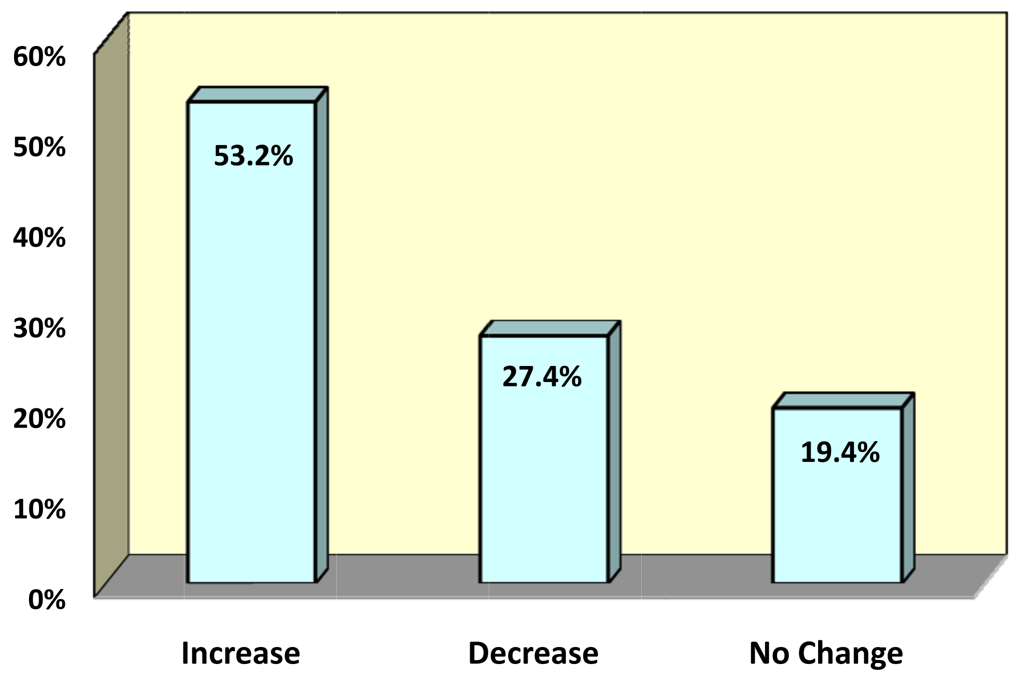


Again, almost 80% of respondents feel that business partners will mostly look at the existing value propositions of cost, quality and service or put greenness into the mix at equal consideration. Only about 20% of the respondents expect greenness to carry favors with business partners. It is very clear that respondents for this survey understand how important it is for green activities to support and enhance the existing business proposition.

A warning signal emerges when one looks at the preceding analysis and compares to the answers to the following question: "Do you expect costs of doing business as a result of 'greener' products or services will increase, decrease, or remain unchanged?"

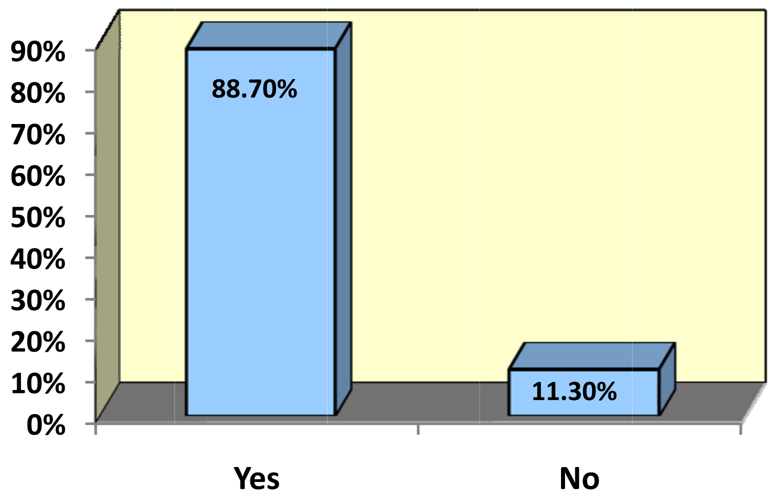
More than half of our respondents feel that green activities add to the cost of doing business. Yet they also understand the doing business with customers does not rely on green activities, but instead on the tradeoff between costs, quality and service. If the cost of doing green business cannot be controlled, sustainability efforts may suffer.

Figure 20: Change in Costs of doing Business due to Greener Products



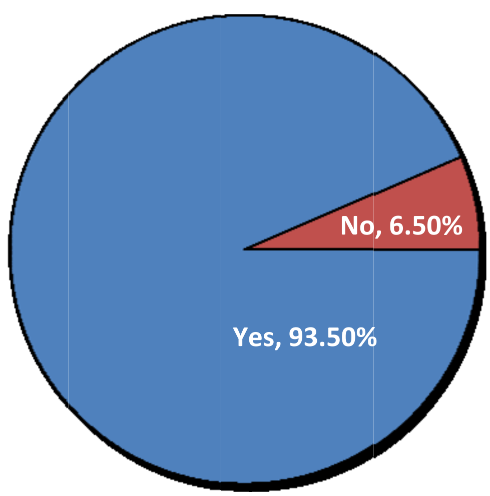
A fear of increased regulation continues to exist. Almost 90% of all respondents answered yes to the question: “Do you think the future legislative landscape regarding climate change will lead to increased regulations on 'green'/sustainable business practices?”

Figure 21: Increase in Regulation on Green Practices



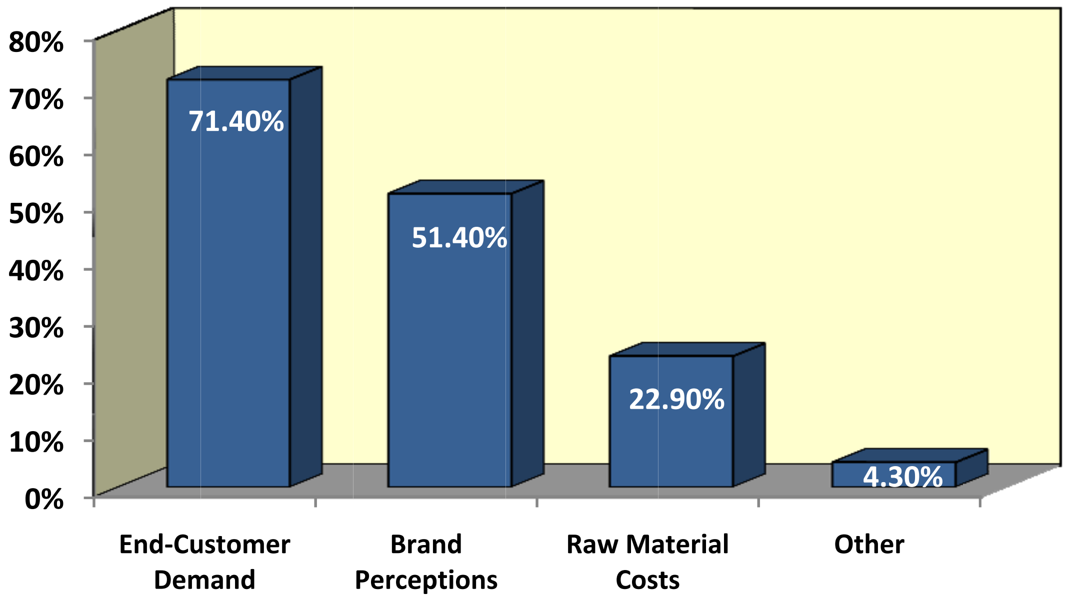
At the same time respondents also feel that market forces will pressure them to engage in green activities. The question: “Do you think market forces will lead to increased green'/sustainable business practices?” was answered with a yes by more than 9 out of 10 respondents.

Figure 22: Market Force Influence in Green Practices



The market forces that were most frequently mentioned to impact green effort were: End-Customer Demand, Brand Perceptions, and Raw Materials Costs.

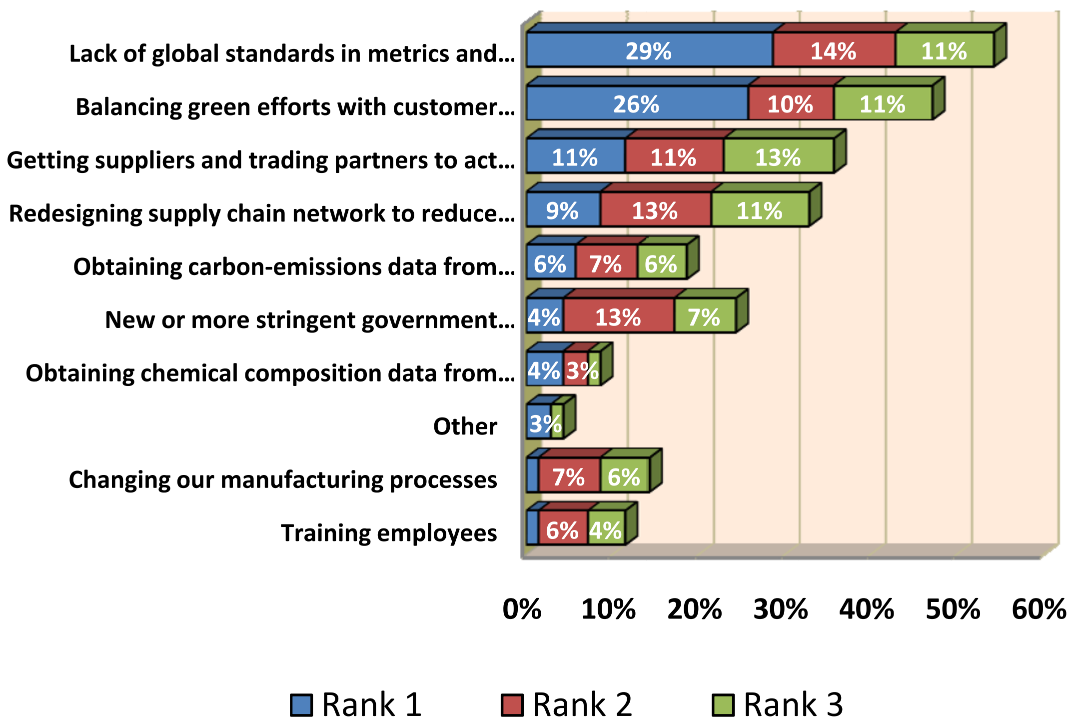
Figure 23: The Market Forces



VIII. Challenges to Green Supply Chain Implementation

We conclude our analysis by listing the challenges that respondents listed when implementing sustainability activities. Lack of standards in regard to metrics and measurement methodologies points to the need for more knowledge development throughout industries. The need to keep customers' existing value propositions that are based on quality, costs and service expectations are the second most important challenge.

Figure 24: Supply Chain Implementation Challenges



The overriding theme for the green supply chain forum at Florida International University in February 2008 was the integration of green supply chain management within the basic business proposition and green supply chain impact on the bottom line. Clearly, industry is longing for a better understanding of how green efforts impact the business processes including costs and how green efforts can be harnessed to bring manufacturing costs down while not negatively impacting quality and service.

IX. Overall Industry Implications and Conclusions

The State of Green Supply Chain Management today can be summarized this way: We are still in the early adopter phase, and the leaders are mostly large companies (over $1 billion in revenues) that are focusing their efforts primarily on 'low hanging fruit' opportunities to reduce costs, improve the environment, and enhance public relations.

All of the companies surveyed believe "greenness" will have some importance in consumer purchasing decisions and supplier selections in the future, and 20% believe it will play a "very important" role. In addition, almost 90% of the companies surveyed believe new government regulations related to climate change and sustainability will emerge down the road. Therefore, it's clear that companies are not treating sustainability as a fad, but as a new aspect of achieving business success, along with cost, quality, and service. This is why sustainability efforts are being driven by the CEO and the Board of Directors at many companies.

But much more work is required, particularly to develop and implement standard metrics and measurement methodologies. History has shown repeatedly that standards accelerate the adoption of technologies, products, and business processes; the same will hold true for sustainability practices once globally accepted standards are developed and implemented, and government regulations are harmonized around the world.

Similarly, in order to achieve the greatest environmental and financial benefits, in the shortest amount of time, sustainability and "green" efforts must be viewed as a global business initiative that extends across companies and industries. This implies that companies must not only work collaboratively with their suppliers and customers, but also with their competitors. However, almost none of the companies surveyed are currently working with competitors on sustainability efforts, and almost none plan to work with them in the future. While opportunities may exist for companies to leverage "green" practices as a competitive weapon, you can argue that even greater benefits exist, for the entire business community and the planet, if companies instead share their experiences and successes in this area with one another.