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# **Sustainability and Effective Supply Chain Management: A Literature Review of Sustainable Supply Chain Management**

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### Abstract

Sustainable supply chain management has become a growing research theme over the past decade. As corporations have devoted more resources to implementing sustainable supply chain programs, the call for research has increased. This report identifies and describes recent academic studies related to the sustainable supply chain factors that have led to effective supply chain management. This literature review has shown that there are numerous process-specific and issue-specific supply chain interventions that have produced positive environmental/social and financial returns. However, it is important to also note that not all interventions will lead to financial success and that many programs require trade-offs. It also identifies notable gaps in the current literature and provides recommendations for areas where researchers can focus research that can help business leaders implement successful sustainable supply chain management programs.

## INTRODUCTION

Over the past two decades, supply chain sustainability has become an area of significant interest for both corporations and researchers. As corporations have expanded their global reach, they have faced scrutiny over the actions taking place in their supply chains. This scrutiny has uncovered deforestation, water depletion, child and forced labor, corruption, and countless other negative environmental and social impacts. It has also forced corporations to apply a sustainability lens to their supply chains to avoid or mitigate these negative consequences, creating the field of sustainable supply chain management (SSCM). Many supply chain sustainability programs started as niche programs targeting specific customer segments or as ways to comply with regulations. However, as SSCM has become more sophisticated, researchers have begun to examine the link between SSCM and improved financial performance. This report will examine the current state of academic research on whether certain supply chain interventions can benefit environmental and/or social performance while simultaneously improving operational and financial performance.

### *Key Definitions*

Prior to literature analysis, we define the key terms that are the foundation of these studies:

Supply Chain Management: A supply chain is comprised of all the parties and processes involved in fulfilling a customer request.<sup>1</sup> Seuring and Muller (2008) define the supply chain as “...all activities associated with the flow and transformation of goods from raw materials stage (extraction), through to the end user, as well as the information flow.” (Seuring and Muller 2008, 1700). These processes include but are not limited to research and development, raw materials procurement, purchasing, distribution, production, delivery, retail, use, and disposal.

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<sup>1</sup> Xiao, W. New York University Leonard N. Stern School of Business Supply Chain Management Course Syllabus. Retrieved from [http://web-docs.stern.nyu.edu/ioms/SYLLABI/Xiao\\_OPMGGB230630\\_Spring17.pdf](http://web-docs.stern.nyu.edu/ioms/SYLLABI/Xiao_OPMGGB230630_Spring17.pdf).

Sustainable Supply Chain Management: The studies reviewed all offer a variety of definitions of sustainable supply chain management. Although these definitions differ slightly, most of them attempt to incorporate environmental, social, and economic value into the management of a firm's supply chain. Giunipero et al (2012) define sustainable supply chain management as "...the extent to which supply management incorporates environmental, social, and economic value into the selection, evaluation and management of its supply base." (Giunipero et al. 2012, 260). The studies try to quantify the value of specific initiatives to determine the synergies and/or tradeoffs.

Financial Performance: There are a variety of ways that the studies have defined financial performance. The metrics used to measure financial performance as it relates to SSCM fall into three categories: 1) lower costs; 2) increased revenues; and 3) improved stock price. Under lower costs, studies examined operational efficiencies, higher quality, and risk management. Under increased revenues, studies examined higher volumes, greater productivity, price premiums, new market entry, and social license to operate. Studies focused on increased stock prices examined the effects of SSCM initiatives on shareholder value in the short and medium term.

### *Report Organization*

The rest of the paper is organized as followed: Process-specific SSCM interventions, issue-specific SSCM interventions, gaps and limitations of the current SSCM research, conclusions, implications, and possibilities for future research.

Process-specific SSCM interventions ask the question "what sustainability actions within the supply chain are being used to drive superior environmental, social, and financial performance?" This report will examine different steps in the supply chain (such as procurement, production, etc.), supplier auditing and monitoring, supplier relationships and capacity building, and technological innovations.

Issue-specific interventions focus on topics outside of typical supply chain management or topics that only affect certain supply chains (i.e. deforestation and agriculture), but are focused on concrete issues that can affect multiple actors within a given chain. These issues include carbon and water footprint reduction, third party certification, climate resiliency, deforestation free supply chains, and the role of external stakeholder pressure.

The gaps and limitations section examines where the research is currently lacking. These gaps include a general focus on environmental and/or social impacts as opposed to financial impacts, more environmental than social studies, notable industry gaps, and a tendency to use data from leading sustainability companies instead of the laggards. Another interesting gap is that most of the studies are focused on supply chains in Europe and developing countries. There are very few studies examining on the ground initiatives in North America.

Finally, the conclusions and implications section will summarize the findings of this report and will recommend future areas of research where researchers can devote resources that will deliver concrete and practical results for academics and professionals.

### *Summary*

A review of both process specific and issue specific SSCM interventions has shown that there is a relationship between environmental/social and economic performance. It is an oversimplification to say that embedding sustainability into a supply chain and trying to maximize value for all those in the chain will lead to financial benefits for all. However, many studies show that there are process-specific and issue-specific sustainable supply chain interventions that have led to positive economic performance. This study also identifies a number of gaps in the existing research and outlines areas of potential future research.

## METHODOLOGY

This report is a review of 62 academic studies in peer-reviewed academics journals or consulting reports on the relationship between SSCM and financial performance obtained through the NYU online research library and the EBSCO Discovery Service. Examples of search terms used to find studies include: “sustainable supply chain management”, “sustainability”, “operational performance”, “financial performance”, “supplier capacity building”, “supplier auditing and monitoring”, and “third party certification.” Along with unique search queries in the EBSCO Discovery Service, a waterfall approach was used to examine what studies were being cited by the extant literature. Of the 62 articles, 52 were published in 2010 or later, which shows the proliferation of research in the field over the past 6 years.

The studies feature a variety of data sources and methodologies. Types of studies include: literature reviews, case studies using interviews and surveys from sustainability and supply chain practitioners, case studies using corporate sustainability reports and third party metrics such as Sustainalytics and the GRI, Delphi studies, econometric studies, financial statement analysis, and consulting studies. The studies are published in many academic journals from the fields of sustainability, operations, and general management, such as the *Journal of Cleaner Production*, the *International Journal of Production Economics*, the *Journal of Production and Supply Chain Management*, the *Journal of Business Logistics*, and *Global Environmental Change*.

## PROCESS SPECIFIC INTERVENTIONS

There are often numerous actors within a given supply chain that have the power to impact the environmental/social and financial impact of a product. Multinational brands are beginning to understand this impact as they examine the entire life cycle of the product (Seuring and Muller 2008). According to Carter and Rogers (2008), this look at the overall supply chain has allowed companies to integrate key business units and to identify strategies within each step of a supply chain that can help

deal with sustainability issues. These strategies include supply chain configuration, supplier monitoring, and supplier capacity building. The below section outlines these strategies and their results.

### *Steps in the Supply Chain*

This section outlines studies focused on the financial impacts of SSCM initiatives that take place in a typical supply chain. Researchers have examined sustainability interventions from the raw materials procurement stage all the way to the end of life stage. For example, Srivastava (2008) found that most of the studies in SSCM have focused on Life Cycle Assessment, eco-design and green manufacturing, purchasing, reverse logistics, and waste management. Along with examining different stages, researchers have also studied a variety of metrics to quantify financial impact, such as lower costs and higher revenues.

Parmigini et al. (2011) argue that the configuration of a supply chain is the biggest determinant as to whether a buying firm should focus on auditing and monitoring or collaboration and joint processes. Efficient supply chain configurations, which feature stable product designs with little variety, should be focused on cost cutting, process improvement, and supplier sustainability performance monitoring. Market responsive supply chain configurations, which feature products that are designed to react quickly to market changes and require more investments in inventory and capacity, should be more focused on joint product design, flexibility, and supplier collaboration to achieve maximum social, environmental, and operational performance. Brodt et al. (2013) examine the role of supply chain configuration in their study of the processed tomato supply chain in the US. Their findings are described in more depth in following sections, but the study looks at the environmental and operational tradeoffs associated with regional and national supply chains and finds that national supply chains can have lower GHG emission rates despite longer distance transportation due to the efficiencies of economies of scale.

An increasing area of study is the relationship between the implementation and performance of SSCM programs and corporate financial performance, as measured by share price. Although this metric is more removed from supply chain performance than other financial metrics, it is an important measure for practitioners concerned about their fiduciary duties. Both Bose and Pal (2012) and Dam and Petkova (2013) isolate the effects of environmental supply chain sustainability programs on stock prices. Bose and Pal (2012) find that manufacturing firms, firms with high R&D expenses, early adopters, small firms, firms not on the Dow Jones Sustainability Index, and low growth firms all experienced abnormally positive returns on the day of, or, day after the announcement of a green SSCM initiative. They define green SSCM initiatives to include closed-loop supply chains, green product or process design, ISO certification, excess usage policies, and remanufacturing and recycling programs. Dam and Petkova (2013) produce different findings, arguing that there is a negative relationship between SSCM announcements and stock performance. They examined the change in stock prices of 66 companies after the announcement of their participation in the Environmental Supply Chain Sustainability Program (ESCSP) of the Carbon Disclosure Project (CDP) and found firms' stock prices decreased by an average of 3.2%. It is important to note that Bose and Pal (2012) examined corporate controlled SSCM programs while Dam and Petkova (2013) examined corporate participation in third party SSCM programs.

Along with stock performance, studies have also examined the effect of SSCM interventions on corporate return on assets (ROA) and return on equity (ROE). Wang and Sarkis (2013) find that an integrated SSCM program that includes both social and environmental efforts is associated with increased ROA and ROE. Based on Bloomberg information from 411 US-based companies between 2009-2011, they find a negative relationship between environmental-only SSCM programs and financial performance, showing the necessity of an integrated strategy. It is important to note that they assigned a binary variable to SSCM interventions and did not evaluate the quality of individual SSCM initiatives. Ameer and Othman (2012) produce similar findings in their study comparing the financial and

sustainability reports of the Global Sustainability Research Alliance (GSRA) Top 100 Sustainable Companies to and 3,000 other firms from developed and developing countries. The GSRA evaluates firm sustainability performance based on community engagement, environmental performance, and ethical standards performance. They found that financial performance depended on industry, but that high sustainability performers in the industrials sector experience higher sales growth. Those in the consumer discretionary and telecom industries had higher ROAs. Those in the energy, healthcare, materials had higher profits and cash flows from operations compared to conventional companies in that industry.

Other studies looked at SSCM through a risk management approach. Giannakis and Papadopoulos (2015) surveyed 600 supply chain managers from French and UK companies and found that endogenous environmental and social risks are highly interconnected with financial performance. They argue for a more integrated risk management strategy because of the large differences between sustainability and typical supply chain management risks. According to the authors, sustainability-related risks “...consider consequences on the natural ecosystem, corporate reputation, financial exposure, as well as compliance with laws, rather than [just] disruptions in supply chain operations.” (Giannakis and Papadopoulos 2015, 456). Lam and Quinn (2014) argue that sustainability and SSCM need to be incorporated into firms’ Enterprise Risk Management programs because they argue that typical ERM systems are often siloed and cannot uncover all sustainability opportunities and risks because sustainability risks often fall outside typical business units. Hofman et al. (2014) describe how external stakeholders are the factor that separates SSCM risks from traditional supply chain risks. Whereas a typical supply chain risk is the possibility of a negative variation from an expected outcome that results in a negative consequence, a SSCM risk is often brought on by a supply chain disruption or an external stakeholder uncovering an issue and determining it unacceptable. Therefore, typical risk management processes can miss sustainability issues and stakeholder identification, mapping, translation, and management need to be incorporated into traditional risk management approaches.

Kim et al. (2014) took an econometric approach to compare the supply chain surplus of conventional and sustainable supply chains. They found that the overall surplus in a sustainable supply chain is greater than a conventional supply chain because firms will produce at the social equilibrium instead of the market equilibrium. The market equilibrium would prompt firms to have an oversupply, which leads to higher inventory costs and poorer environmental performance.

Bendul et al. (2016) outline how SSCM can enable multinational firms to enter Base of the Pyramid (BOP) markets. Through case studies of 18 companies in China, India, and Ghana, the authors find that companies need to develop simpler and more localized supply chains to access these markets. These models can incorporate more local actors and consumers which builds the community's capacity to build the product and help educate consumers on the benefits of the product. Using a modified SCOR framework, the authors divide the supply chain into three management processes: plant and source, make, and deliver. They find that the companies that have most successfully accessed these markets in India, China, and Ghana have localized these three processes. Moreover, they argue that these processes can have a larger impact on producers and consumers in the communities than supplier training or certification programs. This paper puts forward alternative arguments to new market entry and economic development.

Geng et al. (2017) find a positive relationship between Green Supply Chain Management (GSCM) and economic, operational, and environmental performance for manufacturing firms in Asian Emerging Economies. The authors separated GSCM into 5 parts and determined that a firm exhibited GSCM if there was proof that they practiced at least one of these parts. The 5 parts are intra-organizational environmental management, product eco-design, green supplier integration, green customer cooperation, and reverse logistics. They found that intra-organizational environmental management practices, green customer cooperation, and green supplier integration were most strongly associated with economic performance while eco-design was most associated with operational performance.

Esfahbodi et al. (2016) produce different findings in their study on the effects of SSCM on the environmental and cost performance on 128 manufacturing firms, 72 located in China and 56 in Iran. SSCM adoption in both countries led to improved environmental performance but limited and insignificant cost performance. The authors evaluated SSCM based on sustainable procurement, sustainable distribution, sustainable production, and reverse logistics/investment recovery and found that only sustainable procurement in China had a positive and significant impact on cost. However, the authors note that sustainability movements in each country are nascent and believe that future government regulations and incentives will start to improve the cost performance of SSCM.

Zhang et al. (2014) use Life Cycle Assessment and other supply chain optimization tools to examine the relationship between total costs, GHG emissions, and lead time in the supply chain of a Dow Chemical company with 17 raw materials producers, 7 plants, and 268 customer regions. The authors used these three metrics to see the financial and operational impacts of improving environmental performance. Using the decision variables of raw materials purchasing, supplier selection and distribution, order allocation, and the overall material flow, the authors found strategies that minimized each objective function. There is a clear trade-off for each minimization. For example, the minimum GHG solution has a total cost 30% higher than the minimum cost solution. Despite the higher cost, this strategy had 10% lower GHG emissions than the minimum cost solution. It is likely that the supply chain managers use a hybrid strategy based on these three objectives, but it is interesting to note the cost and production effects of reducing GHG emissions.

Surroca et al. (2010) argue that the relationship between SSCM and corporate financial performance is mediated by certain intangible resources that can operate in both causal directions and create a virtuous circle. Based on regression analysis of 600 companies from the Sustainalytics database, they find that innovation resources, human capital performance, reputation, and firm culture are the

four main intangibles. For example, high SSCM performance attracts top talent and increases employee retention, which lowers human capital costs.

The studies discussed above cover a variety of SSCM interventions and track their impacts using a variety of financial measurements. Although the findings are not uniform across all studies, it is clear that SSCM is becoming an important priority for supply chain managers and that any information associated with the costs and benefits of these programs is valuable in an area that regularly operates with uncertainty.

### *Supplier Auditing and Monitoring*

As supply chains have globalized and firms have become increasingly responsible for the actions that occur throughout their supply chains, regulation of environmental and social standards has manifested itself as companies create codes of conduct and audit their network of suppliers based on these codes (Locke et al. 2007). Codes of Conduct have been particularly popular in the manufacturing industry and generally force suppliers to comply with either local laws or company-specific regulations in the areas of environmental performance, product quality, and labor standards. Companies will then audit their suppliers to ensure that the codes are being followed. If a violation is uncovered, the firm will work with the supplier to correct the violation or discontinue the relationship (Egels-Zanden and Lindholm 2014). These audits are generally performed by employees of the focal firm or of third-party auditing organizations, such as the Fair Labor Foundation or the Fair Wear Foundation (Egels-Zanden and Lindholm 2014). Overall, audits have become standard operating procedure for many supply chains because they are the most effective way to ensure that suppliers are living up to Codes of Conduct and other purchase order agreements. However, they have proven to be costly, time consuming, and easily manipulated, and some have argued that they are an inappropriate use of resources. Scholars agree that

audits should be part of the foundation of a sustainability strategy, but further actions are needed to gain a competitive and financial advantage.

Egels-Zanden and Lindholm (2014) analyze the audit reports of 43 factories that supplied firms that were members of the Fair Wear Foundation (FWF), a multi-stakeholder initiative composed of European apparel and footwear companies. The researchers looked at how factory performance on specific worker rights (i.e. child and forced labor) and process rights (i.e. harassment and freedom of association) changed between FWF audits. The results showed that the number of violations decreased by an average of 15% during the 26 months between the first and second audits. However, the results also showed that the audits uncovered process rights violations in less than 5% of the factories, suggesting that audits are unable to uncover these types of violations (a more likely scenario than only 5% actually having human rights violations). The scholars argue that audits give firms a false sense of security and reinforce a process that actively misses a crucial aspect of SSCM. They argue that the existing auditing framework is not an effective allocation of firm resources.

Locke et al. 2007 (A and B) examine the reasons for such drastic variability in social and operational performance between factories located in similar geographic areas and making the same products based on Nike supplier audit reports. Overall, the factories scored a 65/100 on Nike's M-Audit, which was the primary social auditing tool. However, there was a standard deviation of 16%. Moreover, 86% of the factories either stayed the same or regressed on their second audit. To better understand these variations, the scholars examined two Mexican factories that made the same products, had workers from the same union, and had similar M-Audit scores. Despite these similarities, one factory had workers who were paid higher, worked fewer hours, had voluntary overtime, had a say in the production process, had lower turnover, had higher productivity, and lower overall unit costs. The authors argue that this factory's superior social and financial performance is due to the adoption of lean manufacturing, heavy investments in worker training and human resource management, and a more

collaborative relationship with Nike staff. Nevertheless, these two factories had very similar audit scores. These findings led the authors to question whether audits are capable of uncovering both the risks and the opportunities within a firm's supply chain. More information on firms going beyond audits can be found in the Supplier Relationship and Capacity Building section.

Kashmanian (2015) builds on these findings and argues that SSCM is a pyramid with basic compliance using audits being the foundation, and supplier partnership and capacity building programs being the walls and roof. Supplier partnership and capacity building programs have the best chance of creating a competitive advantage and shared value. The author argues that audits can help map out suppliers, mitigate business risks and expose inefficiencies, but are insufficient in motivating better performing suppliers and enhancing market access. Klassen and Vereecke (2012) publish similar findings, arguing that auditing is necessary but insufficient. Based on interviews with supply chain and sustainability managers at 5 multinational firms from a variety of industries, the authors find that firms have generally developed their auditing strategies due to regulation or NGO pressures. However, it is difficult to obtain a real competitive advantage without moving beyond auditing and mitigation to development in the area of social issues in factories. The studies outlining the impact of third party certification in fisheries and forestry present different findings and will be discussed in a later section.

Ahi and Searcy (2015) examine the increasing number of unique metrics that firms use to evaluate the social and environmental performance of their suppliers. They argue that this number can lead to confusion and manipulation and inhibits significant progress. Based on 445 peer-reviewed articles and corporate sustainability reports, they identified 2,555 unique metrics, 93% of which were used fewer than four times and only 0.2% of which were used more than 20 times. This overwhelming number of metrics can lead to audit fatigue for suppliers, who often have different audit standards for each buyer. It also inhibits focus on improving economic, social, and environmental performance.

The above studies have shown that the existing auditing framework is necessary but insufficient. As supply chains have expanded, auditing and monitoring have become increasingly complex and costly. These findings are pushing leading firms to reconsider their dependence on audits and to develop new forms of supplier management and evaluation.

### *Supplier Relationships and Capacity Building*

Many firms have begun to transition from SSCM strategies centered on auditing and monitoring to strategies that are focused on developing capacity and creating stronger relationships with their most strategic suppliers. Lund-Thomsen and Lindgreen (2014) discuss how the cooperation paradigm is beginning to replace the current global compliance paradigm. This cooperation paradigm is focused on better purchasing practices that can increase suppliers' workers' wages, better production planning practices, more long-term buyer-supplier relationships, and involving suppliers in new product development to create higher levels of productivity and quality. However, Seuring and Muller (2008) outline the tensions between companies and NGOs as it relates to supplier relationships. According to their analysis, companies are beginning to lean more toward supplier integration and development while NGOs believe sustainability comes from enhanced supplier auditing and monitoring. Gualandris et al. (2015) argue that the current monitoring system is too narrowly focused and needs to become more strategic. The studies below focus on the link between these stronger relationships and improved environmental/social and financial performance. Many of the studies have shown that developing human resources and management systems, training in lean manufacturing, and investments in new technologies and infrastructure are associated with increased production, higher quality, more on-time deliveries, and fewer defects. These capacity building tools are sustainability related because they can improve human rights performance through increased wages and more reasonable working hours and improve environmental performance through efficiency gains and waste reduction. Despite these links, many firms are reluctant to implement these programs due to high upfront costs.

Carter and Jennings (2002) find that there is a link between buyer-supplier relationships based on social responsibility and increased operational performance. Based on interviews with 200 purchasing managers from consumer goods firms, the authors argue that purchasing managers who are involved in socially responsible activities are more likely to develop strong relationships with suppliers with the same values. These common values improve trust, encourage collaboration, and decrease the possibility of opportunistic behavior. They also had direct, tangible, and positive effects on supplier quality, lead times, and efficiency.

Longoni et al. (2013) examines the relationship between the adoption of lean practices and philosophies on the operational and health and safety performance in the supply chains of 10 Canadian-based manufacturing and distribution firms. Training in lean manufacturing is a common example of supplier capacity building, as many previous studies have shown the link between lean and operational performance. However, lean manufacturing's effect on health and safety outcomes had not been as clear. The findings show that the adoption of the four crucial aspects of lean manufacturing (just-in-time, quality management, total preventive maintenance and HR management practices encouraging cross-training) is positively associated with improved operational and health and safety performance. Operational performance is measured by profitability, growth, flexibility, and delivery. Health and safety performance is measured by injury rates and days lost to injury. Locke et al. (2007A) has similar findings based on their experience in two Nike factories, one that used lean manufacturing and one that did not.

The relationship between supplier integration and financial performance has been another common area of SSCM research. Wing-Yan et al. (2016) outline aspects of supplier integration that include the use of common IT systems, the development of long-term relationships, joint goal setting and continuous improvement, joint product development, production flexibility, joint quality control, and joint inventory management. Based on their analysis of the sustainability and financial reports of 90 Asian fashion companies between 2006-2010, Wing-Yan et al. (2016) find that increased supplier

integration had a positive effect on net income, inventory turnover, and ROA. This effect was stronger during financial crises, most likely due to the flexibility associated with high levels of supplier integration. Lehoux et al. (2015) produce similar findings in their study of the interfirm relationships of five Canadian sawmills (suppliers) and one paper mill (buyer). The authors found that the sawmills collectively increased their profit by 44% through regular replenishment, vendor managed inventory, and collaborative planning, forecasting, and replenishment. Prior to integration, the suppliers were trying to minimize their own costs, which led to low profits and low quality. Integration with their competitors uncovered more efficiencies and made the supply chain more flexible. Laursen and Anderson (2015) examine the relationship between supplier integration and new product development among Unilever strategic suppliers and found that suppliers produced innovative and environmentally sustainable products when they were forced to collaborate with each other.

Klassen and Vereecke (2012) argue that managing the social performance of suppliers through collaboration can lead to reduced risk, reduced costs, and increased chances for revenue growth and market development. Their interviews with sustainability and supply chain managers from leading multinational firms provided multiple methods for improving the social and financial performance of suppliers, such as financial incentives for adopting Codes of Conduct, process and management training, and creating social development programs in supplier communities. Smith (2008) look at the different kinds of European food supply chains and find that the development of strong supplier relationships can cut down monitoring and acquisition costs, increase smaller supplier capacity, and lead to valuable knowledge and technology transfers. These knowledge and technology transfers are particularly valuable for buyers and suppliers because buyers can benefit from higher quality products and suppliers can benefit from infrastructure upgrades. The author lists examples of technology transfers that Danone, Unilever, and other multi-national brands have used.

Supplier capacity building is an emerging theme in SSCM. Since many of these programs are pilots, the data is still limited and incomplete. However, the data has already showed many examples of supplier relationship improvements resulting in improved environmental/social and financial performance.

## **ISSUE SPECIFIC INTERVENTIONS**

There are issues that are outside typical supply chain management or only affect certain supply chains but are focused on concrete issues that can affect multiple players within a given chain. For example, issues such as deforestation and water use abnormally affect agrifood supply chains. Moreover, external stakeholders have become significant change agents in certain supply chains. The section below outlines the results of these issue specific interventions in the fields of water and carbon reduction, third party certification, deforestation free supply chains, climate resiliency, and stakeholder pressure.

### *Water and Carbon Reduction*

There is a growing trend to better track water and carbon use. Studies are focused on ways that supply chains can reduce water or carbon use, but few track the financial implications of these reductions. Financial benefits can be gained from water reduction, despite upfront costs. It is important to note that water reduction might increase (or decrease) carbon use or other environmental metrics so the environmental trade-offs are important to note. In terms of carbon, Hanifan et al. (2012) determine that 50-70% of total expenses and GHG emissions for manufacturing companies come from their supply chains. Given that these suppliers are often vulnerable to water and climate change risk, it is necessary to understand the costs and benefits to carbon emissions and water use.

Aivazidou et al. (2016) write about the increasing practice of firms tracking their water footprint throughout their entire supply chains. They examine the water footprint across the procurement, processing, packaging, transportation, retailing, consumer use, and waste management stages of firms

in the agrifood, livestock, wine, biofuel, light industry, and heavy industry supply chains. They found that the specific products and location of production greatly determine the water footprint and that certain processes, such as transportation using traditional fuels, will have a high carbon footprint but a low water footprint. Therefore, it is necessary for firms to understand these environmental tradeoffs. The authors then proceed to develop a framework that firms can use to reduce the water footprint in their supply chains and reduce their risk exposure to water shortages. The framework offers three approaches: strategic, tactical, and operational. The strategic approach involves developing less water intense crops, increasing crop rotation, and raising consumer awareness. The tactical approach involves enhancing water retention in soil and changing product composition. The operational approach involves using pesticides and fertilizers more prudently and improving packaging.

Christ (2014) finds that water footprint analysis (water management accounting) is crucial to the long term financial viability of Australian wine supply chains. Based on survey responses from 405 wineries, she finds that water management accounting is becoming a crucial tool to collect physical and monetary information about the long-term implications of their current water use. The wine supply chain uses a large amount of water and Australia is prone to frequent droughts. Christ argues that water management accounting practices, such as quality control, runoff protection, wastewater treatment, and groundwater stock management, are crucial to the optimization of the wine supply chain.

Gallego-Alvarez et al. (2014) examine the relationships between reduced greenhouse gas (GHG) emissions in the supply chain and corporate, financial, and operational performance and find a positive and significant relationship with financial performance but an insignificant relationship with operational performance. Based on the financial and sustainability reports of 89 Fortune 500 companies in resource-intensive industries, reduced GHG emissions significantly improved a firm's ROE (metric to show financial performance) but an insignificant effect on ROA (metric to show operational performance). Hanifan et al. (2012) report that 40% of members of the Carbon Disclosure Project (CDP) reported financial savings

from emissions reduction and 33% benefited from new revenue streams or savings gains from supplier emissions reduction programs. These findings contradict some of the findings of Gallego-Alvarez et al. (2014) as new revenue streams and savings gains from supplier emission reduction programs are operational benefits.

Brodthorn et al. (2013), one of the few studies focused on USA-centric supply chains, compare the environmental impacts of regional and national processed tomato supply chains. Through life cycle assessments of California produced conventional and organic tomato paste that is shipped to Michigan via rail and Great Lakes region produced tomato paste that is shipped to Michigan via truck, the authors find that California-produced tomatoes are much more environmentally and operationally efficient than the regionally produced tomatoes. The California production used 78% of the energy and emitted 67% of the GHG emissions of the regional per final kilogram produced. They also benefited from higher per hectare yields and soil amendments (a nutrient added to the soil to improve crop growth and health, generally lime or gypsum), which offset the increased transportation costs. Finally, they determined that transportation accounts for less than 10% of the total energy usage of the processed tomato supply chain when rail is used.

### *Third Party Certification*

Third party certification organizations, such as the Rainforest Alliance and Fair Trade, have become important players in the forestry and agricultural sectors in response to concerns about the social and environmental impacts of the expansion and intensification of production (Pinto et al. 2014). This certification is a market mechanism to promote social and environmental sustainability of products and systems. In theory, individual farmers or groups of farmers can be certified if they are in compliance with a number of criteria relating to their management systems, agronomic, environmental, and social issues. If the farms become certified, they have the possibility of charging a price premium for their

product and can benefit from greater efficiencies due to the adoption of certified management systems (Pinto et al. 2014). There is an abundance of research examining the effects of these certification programs on the farmers' and cooperatives' financial performance. Although these studies differ on which financial benefits farmers can capture, they agree that certification has had a positive financial impact on the producers of raw agricultural materials.

Sanderson et al. (2016) look at the effects of third party certification on climate resiliency by comparing the biodiversity levels of Rainforest Alliance certified, non-certified, and organic Chiquita banana suppliers. Biodiversity is an important measure for climate resiliency because it can be helpful in pest reduction, soil improvement, recycling of nutrients, and overall financial risk reduction. They find no real difference between large Rainforest Alliance certified and non-certified suppliers in terms of biodiversity levels and both performed significantly worse than organic farmers. The authors imply that the management systems of Rainforest Alliance certification may not really be catching on or that they may be bleeding into non-certified farms. ***It is important to note that other studies exist that show the opposite effects as well.***

Barham and Weber (2012) surveyed 845 coffee growing households in southern Mexico and 300 coffee producing co-ops in Peru that were either conventional, Fair Trade/Organic, or Rainforest Alliance certified to examine whether price premiums or increased yields had a bigger role in the economic sustainability of certification programs. They found that the price premium was about \$0.12/pound or about \$103/year for a small Mexican farmer. However, an additional pound of coffee harvested increased net revenue by \$.86 or \$280 more per hectare. The average farm size was 4 hectares so the net revenue gains from increased yields was more than \$1,100/year. Although the price premiums did benefit Mexican farmers, the benefits were not enough to hire more workers, invest in more land or equipment, or gain access to credit. The increases in yields were largely due to knowledge transfers and capacity building which taught better management practices.

Ruben and Fort (2012) compare production, income and expenditures, wealth and investments, and attitudes of Fair Trade certified and non-certified farms in Central Peru. Certified farmers enjoyed modest increases in income and production but these were limited because of higher labor costs and an inability to sell all their products at the premium. However, certified farmers accumulated more agricultural assets, had better access to credit, could invest more in household and farm improvements, had stronger risk appetites, and had higher satisfaction levels related to cooperation with other farmers. Although the concrete financial measures of income and production were negligible, these intangible financial benefits show the effects of Fair Trade on these farmers. The study also briefly examined the community benefits of Fair Trade that affected both certified and non-certified farmers, such as public infrastructure improvements.

Valkila (2009) present more critical findings of Fair Trade/Organic certification, arguing that its financial benefits are often severely limited, especially for the most impoverished farmers. Based on surveys of 120 Nicaraguan farmers, Fair Trade raised farmer revenue about \$60-\$150/hectare/year in low intensity farming. This amount is not enough to change increase intensity, acquire new land, or get out of poverty. In high intensity situations, the Fair Trade price premium can have a large impact if mainstream prices are low, but little impact if mainstream prices are high. Moreover, worker wages were largely unaffected in both situations. Valkila also found that conventional coffee farmers enjoyed higher production levels, faster payment terms, and access to better financing (loans to conventional farmers often came with 11% interest vs. 18-22% from Fair Trade co-ops). Although organic prices are more stable and there are other benefits to co-op membership, Valkila argues that these certification organizations are a poverty trap for many farmers.

Pinto et al. (2014) study the effects of group certification schemes on small coffee farmers in Brazil and showed the financial benefits for small farmers of the Rainforest Alliance group certification process. One of the benefits of Rainforest Alliance certification is that smaller farms can form co-ops to

access the benefits of certification. Although certification was originally intended to help farmers of all sizes gain access to markets, there is growing concern that large-scale farms dominate the certification process, often blocking smaller farms from access. These co-ops are a way to give more scale to smaller farmers. Therefore, the authors looked at overall farm production, audit intensity, and compliance levels between small farmers in the group certification process and large farmers in the individual certification process. They find that production levels on a per hectare basis were similar for both groups (and both were higher than the national average), the audit intensity was similar but much cheaper for group because the costs are shared, and the overall audit performance and non-conformities were similar.

Raynolds (2009) analyzes the different types of Fair Trade buyers and offer insights for how suppliers can best utilize their certification status. Based on Fair Trade buyer reports and interviews with Fair Trade producers in Mexico and Peru, Raynolds develops three types of Fair Trade buyers: mission-driven enterprises, quality-driven firms, and market-driven corporations. While market-driven corporations, such as Starbucks and Nestle, have economies of scale and scope, they rarely pay above price premiums and are wary of long-term relationships and access to credit. However, mission-driven organizations, who are focused on conforming completely to the Fair Trade ideals to improve environmental and social performance, and quality-driven firms, who associate certification with quality products, are more likely to pay above price premiums, granting credit and longer-term contracts. Raynolds argues that suppliers that want to build their capacities should focus on mission-driven and quality-driven firms despite the scale appeals of market-driven firms.

Delmas and Pekovic (2013) look at the effects of Fair Trade, organic, and ISO 14000 on labor productivity and find a direct and positive relationship. Based on a survey of 15,000 employees from 5,200 French firms in a variety of industries, environmental standards and certifications help increase employee identification with the firm, require the firm to invest more in employee training, and helps employees develop more cross-functional contacts which can all increase job satisfaction and

productivity. Overall, they find a 16% increase in labor productivity from these certifications and the agri-food, transport, and consumer goods felt the highest benefits.

Third-party certification is one of the most extensively researched SSCM themes. Although studies have produced different findings, raw materials producers can reap a multitude of benefits from becoming certified. A future area of research would be the effects that buyers have experienced from purchasing from certified suppliers, such as increased market share, reduced operational and reputation risk, increased customer loyalty, and higher product quality.

### *Climate Resiliency*

Although environment related risks are not new for supply chain managers, the idea of climate resiliency is an emerging research trend in SSCM. BSR, a consultancy, defines supply chain resilience as “the capacity of business and their supply chains to minimize their contribution to climate change and to cope with and adapt to climate-related hazardous events, trends or disturbances, which could include disrupted supply chains, reduced availability of natural resources, infrastructure impacts, disrupted transport and logistical routes, and other unpredictable impacts.” (Retrieved from [https://www.bsr.org/reports/BSR\\_Report\\_Climate\\_Resilient\\_Supply\\_Chains.pdf](https://www.bsr.org/reports/BSR_Report_Climate_Resilient_Supply_Chains.pdf).) Borsa et al. (2014) look beyond the risk reduction aspect of climate resiliency and examine the potential opportunities. These opportunities include finding more stable supplier locations, greater supply chain flexibility, and higher levels of integration between risk management and sustainability departments. Despite the growth in studies, climate resiliency metrics are slow to develop. Sanderson et al. (2016) use biodiversity levels as a proxy for measuring climate resiliency among banana suppliers and outlined the potential costs associated with lower biodiversity levels. However, it is inherently difficult to measure preparedness for an event that is unpredictable and future climate resilient supply chain research must focus on effective metrics. The 2015-2016 Supply Chain report published by CDP and BSR found that suppliers are beginning to

recognize the climate risks that they face but have been slow to implement initiatives to address these risks. They found that 72% of 4,000 surveyed suppliers identified the regulatory and/or physical risks of climate change but only half of them have implemented a climate risk management system and less than a quarter of them are measuring and managing their water-related risks (Retrieved from [https://www.bsr.org/reports/BSR\\_CDP\\_Climate\\_Change\\_Supply\\_Chain\\_Report\\_2015\\_2016.pdf](https://www.bsr.org/reports/BSR_CDP_Climate_Change_Supply_Chain_Report_2015_2016.pdf)).

### *Deforestation-Free Supply Chain*

As the link between cattle ranching and other agricultural procurement processes and deforestation has become clearer, the call for deforestation-free supply chains has become much more prevalent. The number of academic studies researching the effects of a deforestation-free supply chain have increased as many multinational firms, NGOs, and governments have called for more methods to decrease deforestation. Newton et al. (2013) argue that most deforestation-free supply chain rely on institutions, incentives, and/or information. Although government is critical to ensuring that the proper laws are passed to create a baseline level of deforestation, this section will focus more on the incentives and information aspects. Incentives include payments for environmental services (such as REDD+ programs), product certification, and tax and trade benefits. Information can help lead to greater transparency, better management, better monitoring, and more consumer awareness.

Nepstad et al. (2016) examine actions by actors in the Brazilian beef and soy supply chains that led to significant reduced deforestation over the past decade. According to the article, deforestation rates declined by nearly 70% from 2005 to 2013. The scholars attribute this large decline to government regulations that increase the risk of blacklisting, fines, embargoes, and other criminal penalties for landholders, as well as declining market prices for soy. They also argue that market mechanisms, such as payment through ecosystem services, price premiums from certification, and access to new credit and other forms of capital have also played a significant role in the decreasing levels of deforestation. They

argue that it is crucial to improve the market mechanisms and positive incentives for landholders to sustain these high rates of deforestation reduction throughout the Brazilian Amazon.

Gibbs et al. (2016) also examine deforestation free supply chains in the Brazilian Amazon by looking at the success of zero-deforestation agreements between cattle ranchers and slaughterhouses. These agreements led ranchers to join a central Brazilian registry that tracks deforestation, led slaughterhouses to severely decrease purchases from recently deforested properties, and led to much lower deforestation rates for registered farmers. The number of transactions involving ranchers in the central registry increased from 2% in 2006 to 96% in 2013 and 85% of ranchers said that they registered because of these agreements. Slaughterhouses reduced purchases from recently deforested properties from 36% in 2009 to 4% in 2013. NGOs and the Brazilian government were the biggest proponents of these zero deforestation agreements, but the authors have found that there are numerous financial benefits from these agreements for both buyers and suppliers in the Brazilian beef supply chain.

Meyer and Miller (2015) have developed a program that uses jurisdictional REDD+ (Reducing Emissions from Deforestation and Forest Degradation) programs to create zero deforestation zones. REDD+ programs create incentives for jurisdictions with high levels of deforestation to reduce these high levels and promote conservation. Under the framework, developed countries pledge money to help these deforested areas meet certain requirements and then robustly monitor their progress. Since 2005, \$7.5 billion has been pledged. However, REDD+ interaction with the private sector is lacking. The authors argue that Zero Deforestation Zones (ZDZs) should be created from private sector companies that agree to preferentially source. Suppliers would be able to comply with the ZDZ regulations and further build capacity thanks to the funding that they receive from REDD+. This ZDZ framework would reduce costs and risks for brands, allow farmers to produce on a level playing field without having to sacrifice the future for the present, increase revenue for the public sector, and give more revenues and recourse in the event of grievances for local communities. Unilever is piloting this program in Brazil.

Under the program, farmers in Brazilian states that have developed REDD+ programs can receive technical assistance and apply for low carbon agriculture loans. Unilever then agrees to preferentially source from these farmers.

Although deforestation free supply chains require greater upfront and monitoring costs, government incentives and regulations are making them more appealing. As large firms commit more resources, researchers will be able to produce more robust findings.

### *External Stakeholder Pressure*

In what appears to be one of the most classic drivers of sustainability initiatives and disclosure, firms are concerned about negative reputational impacts associated with NGO and consumer awareness campaigns attacking issues in their supply chains. Along with the concern over NGOs and consumers, existing or anticipated government regulation is also a major driver of SSCM initiatives. The articles below explore the impact of external stakeholder pressure on social, environmental, and economic performance.

Sajjad et al. (2015) interviewed senior managers of sustainability and or supply chain management from four large New Zealand firms and find that stakeholder management, along with the importance of sustainability to top management and risk reduction, are the biggest motivators to the implementation of SSCM initiatives. The authors also report that economic benefits associated with sustainability were not seen as a major motivator, but it is important to note that economic performance and stakeholder management are closely related. They imply that these managers are worried about the negative economic consequences of poor sustainability performance versus the positive economic benefits of strong sustainability performance. Seuring and Muller (2008) also find that external pressure and incentives from consumers and regulators are still the biggest triggers for companies to implement SSCM programs. Giunipero et al. (2012) identify government regulations as a

top SSCM driver because companies want to reduce costs as much as possible. Based on a Delphi study of 40 supply chain executives from US-based companies, government regulations were a much bigger driver of SSCM than competitive advantage or government incentives. Wolf (2014) argues that both SSCM and external stakeholder pressure can have separate, direct, and positive impacts on corporate sustainability performance. Based on data from 1,600 companies from the Sustainalytics database, Wolf measured SSCM through the existence of supply chain standards (such as Codes of Conduct), supply chain monitoring systems, green procurement, and positive incentives for high quality suppliers. She argues that companies have implemented these programs regardless of stakeholder pressure and industries are becoming more proactive on sustainability issues.

Pagell and Shevchenko (2014) find that external stakeholders have the power to force companies to implement sustainability programs that may lead to trade-offs between economic and noneconomic performance. NGOs, governments, and communities are not interested in companies' economic performance, but can greatly affect it. This power allows them to force companies to implement programs that might not be "win-wins." This argument runs counter to the findings of Carter and Rogers (2008), who argue that only environmental or social practices that are beneficial for economic performance are truly sustainable. Dauvergene and Lister (2012) present a similar argument that external stakeholders and governments exist to keep brands in check. Although the growth in the political power of brands and increasing collaboration appears to have improved sustainability performance, the authors are concerned that it can lead to conflicts of interest. They argue that NGOs might not be able to hold brands as accountable if they are involved in joint initiatives.

Concerning government regulation, Kim and Davis (2016) explore the effects of Section 1502 of the Dodd-Frank Act on publicly traded companies. Section 1502 requires companies disclose whether their products contain conflict minerals from the Democratic Republic of the Congo area. Given that the companies analyzed had an average of 743 suppliers (some as many as 30,000 suppliers) and the law

requires specific information, this process has been a huge capital investment for firms. However, the article shows that companies are willing to make these huge investments instead of risking paying SEC fines, diminishing stockholder confidence, and risking brand reputation. The external stakeholder view takes a wider view of economic performance to push for more impactful sustainability performance.

Instead of approaching external stakeholder pressure as a risk, Wieland and Handfield (2013) look at the opportunities that can be gained from collaborating with industry peers, local partners, and universities. Collaboration with industry peers is a burgeoning area of research in SSCM, whether it be joint inventory systems or joint standards and third party certification. Although companies might be reluctant to working with competitors, this collaboration can significantly lower auditing and monitoring fees. Collaboration with local partners is also increasing in importance in many industries, but many practices are still disjointed and inconsistent. Finally, collaboration with universities can unlock access to experts in environmental and social issues at a low cost.

Regulators and NGOs were some of the first drivers of SSCM because of their ability to hold large firms responsible for their actions. Firms continue to see legal and financial risk as one of the biggest reasons for implementing SSCM programs. However, as firms continue to expand into countries with poor infrastructure, poverty, low education levels, and low levels of the rule of law, they have realized the opportunities that collaborating with external organizations present. Although the research on this field is limited, firms are increasingly working with governments and NGOs located near their suppliers to build capacity and spur economic development.

## **GAPS IN THE CURRENT LITERATURE AND FUTURE AREAS OF RESEARCH**

Despite the studies described above, there are still several gaps in the current academic literature where research could greatly benefit our understanding the impacts of the sustainability initiatives of multi-national brands. Researchers are in a unique position to develop and test innovative hypotheses in the

field of sustainability. Moreover, these findings can create real world impact for brands and the communities in which they operate as sustainability units are often understaffed and underfunded.

Below are some notable gaps:

*Robustness of SSCM performance:* Many of the studies use a binary variable to measure SSCM. In other words, researchers have often classified a supply chain as sustainable or not. This binary characterization has limited researchers in their ability to evaluate the efficacy of different initiatives or compare them across firms or industries. Moreover, some studies characterize a supply chain as sustainable if they report on at least one sustainability program, such as green purchasing. This practice is limiting because it does not look at the entire supply chain. Although more recent studies have begun to develop more robust measures for SSCM performance and taken a wider look at the entire supply chain, there is still room for improvement.

*A focus on environmental/social performance instead of financial performance.* Despite the number of studies outlined in this report, there is a much larger pool of studies that are more focused on the relationship between SSCM and environmental and social performance and less focused on the financial performance. Granted, these studies can be crucial to researchers and practitioners because it is important to know if these interventions are producing the intended results. However, it is also important to quantify the financial costs and benefits in order to help professionals make informed decisions that will be supported by their boards and stockholders.

*Lack of studies involving social sustainability initiatives:* Many researchers divide sustainability into environmental, social, and economic initiatives. While there are a number of studies examining the effects of environmental initiatives (such as implementing deforestation-free supply chains) on economic value, the number of studies examining the effects of social initiatives on economic value are less common. This paper has featured studies that have criticized the current labor standards auditing

framework as being high cost and low impact and the relationship between lean manufacturing, employer satisfaction, and production. However, this report has been unable to find many studies exploring this theme. Many of the existing studies in the social sustainability field are currently more focused on how social initiatives improve the human rights and labor standards of workers, and not so much the economic aspects of these programs. Although these studies are crucial to ensuring big brand accountability, multi-national firms might be more willing to implement social sustainability initiatives that have proven economic impacts.

*Lack of on the ground studies in North America.* Of the studies reviewed, only three (Brodt et al. 2013, Lehoux et al. 2015, and Langoni et al. 2013) explored SSCM in North American supply chains. Most of the other studies either focused on supply chains wholly contained in developing countries or multi-national brands whose supply chains were primarily located in Europe or developing countries. Granted, most major supply chains are multi-national and academics, governments, civil society, and the private sector have correctly identified the numerous sustainability issues in the developing world. However, it is important to note that there are still numerous sustainability challenges in North American supply chains and it could prove to be a rich area of research.

*Role of Commodity Traders, Distributors, and other Third Parties:* Many of the supply chains featured in this report involve commodities, such as energy, metals, and agriculture, which are often traded in markets far away from the extraction site. Commodity traders can have an immense impact on the prices of these goods, despite not being employed by the supplier or the end buyer. Sustainability is becoming an important factor for these traders and they increasingly rely on third party certification or their own sustainability training programs as a means of both obtaining and providing a price premium for sustainable products. According to an International Institute for Sustainable Development study, the

market share of sustainable coffee has grown from 15% in 2008 to 40% in 2013.<sup>2</sup> Although this report features numerous studies on the effects of certification on farmers and communities, there are few studies on the role that these commodity traders play. Like commodity traders, distributors can have an immense impact on the prices of the goods they are transporting, despite not always being owned by the supplier or end buyer. Brodt et al. (2013) briefly examined the environmental impacts and costs of transporting across the US by rail or truck, but overall there is a need for studies on the role that distributors can play in increasing environmental and economic efficiencies.

*Prioritizing engagement with suppliers beyond capacity building:* This report has featured studies examining the financial implications of moving beyond supplier auditing and monitoring to more strategic relationships with and improving production capacity of suppliers. However, much of the research depends on unique case studies because the paradigm is still growing. As the collaboration paradigm between buyers and suppliers proliferates in the private sector, more robust research on the costs and benefits of these types of programs will appear. Some areas will be buyer-supplier collaboration on R&D and new product development and management systems, the effects on resource and technology transfers, and the development of methods to understand the impacts of lower-tier suppliers. Is it a better use of resources for a firm to invest in HR management systems for their most strategic suppliers and invest fewer resources in their less strategic suppliers or use those same resources to ensure that all suppliers are audited annually? What role can governments and NGOs play in implementing these programs? Given the difficulties of determining the financial impact of social sustainability initiatives, this type of study could be invaluable for sustainability managers.

*Industry Gaps:* Certain industries are more likely to adopt sustainability programs than others. This is due to environmental impact, consumer demands, government regulation, and/or financial

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<sup>2</sup> <http://www.iisd.org/ssi/>

survival. Therefore, SSCM studies are more likely to focus on these industries. Agrifood, extractives, heavy and light manufacturing, and consumer goods have dominated the current state of research. However, as SSCM expands into new industries, the research must follow. Studies on the unique supply chains of the healthcare, hospitality, financial services, and information and communications technology industries are currently lacking and could develop novel insights for these rapidly growing fields.

*Technology and Innovation:* Another area of research is examining the costs and benefits of innovation and technological developments increasing supply chain transparency. Globalization has led to numerous technological innovations for buyers, suppliers, customers, regulators, and NGOs. As supply chains have become more complex, firms have recognized that investments in technology to track their products are necessary. These developments make it easier to find defects quicker and reduce the probability of lost or damaged products. It can also help firms better understand the environmental and social impacts of their products and suppliers. Although there are numerous social, environmental, and financial benefits to these technological developments, they have also increased transparency for regulators, NGOs, and consumers. There are a handful of studies that are starting to tackle this area of research (Wieland et al. 2016, Balfaqih et al. 2016, Figge and Hahn 2012), but examining the financial impacts of greater transparency could be of great help to business professionals who are weighing where they should focus their efforts and what they should disclose.

*Convergence on Common Standards:* Firms are beginning to converge on common sustainability standards and more robust supplier performance measurement. Audit fatigue, data overloads, and high monitoring costs are the primary causes for this push toward convergence. Although there have been numerous studies on the impacts of third party certification on suppliers, an interesting study would be the financial effects of the convergence of standards on large firms. Would these common standards lower monitoring costs for buyers and compliance costs for suppliers? If the data would support this hypothesis, buyers might be more willing to work with their competitors.

## CONCLUSIONS AND LIMITATIONS

This report has shown that the number of academic studies examining the relationship between SSCM and financial performance has increased significantly over the past decade. It also shows the transformation of the area of study from none to using corporate sustainability programs to improve firm public image to focusing strictly on risk reduction to capitalizing on opportunities and developing a competitive advantage. This study has focused on SSCM programs designed to reduce risk and capitalize on opportunities. It has divided the research up into process-specific interventions and issue-specific SSCM interventions and shown that it is possible to implement SSCM programs that have both environmental/social and financial benefits. However, it is important to note that many programs may also involve tradeoffs or might not be able to be replicated across firms and/or industries. Nonetheless, this report can be a valuable resource for academics and practitioners looking to understand what studies exist and where the area can go in the future.

It is important to note the limitations associated with this study. First, only studies published in English were used. Since many of the studies are focused on issues and actions located in Europe and the developing world, the possibility exists that studies not translated into English were overlooked.

Another limitation is that only academic and consulting studies were used. No corporate or NGO reports were used as primary resources. However, some of the studies used corporate and/or NGO reports as data sources. The information contained in these reports could be biased. However, all the studies were published in peer-reviewed journals or leading consulting publications. A separate limitation of using only academic studies is that there is often a time lag between when initiatives are happening and when the studies can be published due to the need for statistical significance and peer review. Although this practice can increase the legitimacy and robustness of the studies, there is often a delay between what leading corporations are doing and what is being published.

Finally, this report can only analyze what was found in the 62 articles covered. As mentioned above, the number of SSCM academic studies is growing and new reports are published daily. This researched was done by one researcher working for 10 hours a week for three months so there are countless studies not covered in this report. Although literature reviews are a valuable tool for finding appropriate studies, this report cannot be considered exhaustive.

Sustainable supply chain management has become a growing research theme over the past decade. This report has identified and described recent academic studies related to the sustainable supply chain factors that have led to effective supply chain management. This literature review has outlined numerous process-specific supply chain interventions, such as supplier sustainability auditing and monitoring, supply chain configuration, and the development of stronger relationships with strategic suppliers can improve financial performance. These interventions have decreased monitoring costs, increased product quality and efficiency, and increased corporate financial metrics, such as stock price, ROA, and ROE. Issue-specific supply chain interventions, such as water and carbon reduction, deforestation-free supply chain, third party certification, and external stakeholder pressure, have also produced positive environmental/social and financial returns. However, it is important to also note that not all interventions will lead to financial success and that many programs require trade-offs. This report has also identified notable gaps in the current literature and provides recommendations for areas where researchers can focus research that can help business leaders implement successful sustainable supply chain management programs.

This list of future areas of research is by no means exhaustive, but outlines issues that could be of great benefit to both researchers and professionals. As supply chains become more complex and the links between corporate activities and environmental and social impacts become clearer, it is imperative that corporations undertake SSCM initiatives whose impacts can be properly measured. Researchers have the capacity to develop these metrics and help others understand these impacts.

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