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Water Management Efficiency in the Food and Beverage Industry

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2016

Abstract

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MS, Brenau University, 2016

BS, University of the Sacred Heart, 1993

Doctoral Study Submitted in Partial Fulfillment

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Abstract

Water is critical for food production, food security, and health. Water quality management influences freshwater sustainability, land, and energy administration. Global agriculture accounts for more than 70% of all water consumption; the fertilizer, manure, and pesticide overspills are chief sources of water pollution worldwide. On a global scale, food-related waste directly impacts local food production and water resource management. The purpose of this multiple-case study on the food and beverage (FB) industry in the State of Georgia was to identify successful strategies for improving water management efficiency. The concepts of systems thinking, adaptive resource management, and integrated water resource management provided the conceptual framework for the study. Data were collected via personal interviews with 2 global supply chain leaders in the FB industry and 1 water expert in the public water utility system in Georgia. The findings showed 10 themes: sustainability; mission-driven culture; ethical responsibility; water quality and governance; food safety and sanitation; water conservation and climatic trends; waste management; nutrition and the freeze drying method; knowledge sharing and collaboration; and water detention and retention systems. The study results are intended to contribute to social change by providing information to global supply chain leaders, policy makers, entrepreneurs, and sustainability leaders to implement sustainability beyond the environmental value; these findings will also help achieve a positive posture on resource overconsumption and waste management for efficient and complex decision making within a worldwide spectrum.

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Dedication

I dedicate this research study to my family, who have supported and encouraged my work with unconditional love and understanding. I also dedicate this work to all of the diligent global leaders in the industry that work every day to do business, society, and the ecosystem a better place for future generations.

Acknowledgments

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I am mainly grateful to God, and my parents who teach the value of education and fundamental values in life. Similarly, I am thankful, to my husband and exceptional children for giving the opportunity to raise, admire, and love them. Lastly, I am thankful for all the people that I met during my doctoral studies, which gave me the opportunity to influence their lives, and were a reason to stay inspired.

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Section 1: Foundation of the Study

This qualitative, multiple-case study explored the leadership practices of 10 global supply chain leaders from three multinational food and beverage (FB) industry companies to identify the best approaches for improving water management efficiency. Global leaders in manufacturing food and beverage need to focus on the emerging issues that equally affect environmental sustainability, social equity, and economic development. Water management is a critical issue affecting businesses, humanity, and the ecosystem (Natural Resources Defense Council, 2013). Improving water management efficiency requires more than identifying risk along the supply chain (NRDC, 2013; UNESCO, 2012). Therefore, global supply chain leaders could coordinate managing water within an integrated framework that encompasses the application of various knowledge from a multidiscipline and multistakeholder collaborate approach. This study was designed to provide an overview of the relevant issues of water management and human actions.

Background of the Problem

This background provides the main preconditions for the sustainability of companies in the FB industry. Water is a valuable resource for the sustainability of businesses, communities, and the ecosystem (United Nations Department of Economic and Social Affairs, 2014). Water is an essential ingredient in the production of food, beverages, sanitation, and health, as well as a significant manufacturing support for the sustainability of many companies in the FB industry (UNDESA, 2014). Freshwater scarcity represents a long-term risk for sustainable water management within (a) the

governments, (b) the economies, and (c) society (Brown & Matlock, 2011). Therefore, freshwater availability is critical to the sustainability of many businesses in the FB industry.

Consumers' views of global supply chain leaders' practices about water management efficiency are an essential strategic element of the sustainability of companies in the FB industry. The Food and Agriculture Organization of the United States (FAO; 2012a) has identified limits in water control related to fulfilling best management practices to encourage water recycling for continuous, sustainable production. The United Nations Educational, Scientific, and Cultural Organization (UNESCO; 2012) has also recognized the importance of consumer satisfaction concerning water efficiency and water conservation incentive programs. Technology was a central role in addressing consumer satisfaction and other implementations crucial to water security.

Lee and Tansel (2013) conducted a survey to gather results of consumers' opinion about water efficient appliances, and the results proved a positive link between behavior and the cost benefits of high efficient technology. Martínez-Espiñeira, García-Valiñas, and Nauges (2014) contributed to the literature by showing that conservation habits closely relate to the purchase of resource-efficient appliances. However, it is also critical that water efficiency initiatives also address the protection of human rights (United Nations University Institute for Water, Environment, and Health, 2013). Therefore, attaining the goal of water management efficiency must consider the ethical

responsibility involved in protecting and sustaining human rights and in attaining sustainable development.

Water management efficiency is crucial for the secure provision of water to the FB industry. Implementing sustainable technologies is important in avoiding fresh water scarcity (Von Korff, Danielli, Moellenkamp, & Hoekstra, 2012). Von Korff et al. (2012) introduced the collaborative approach as an alternative to analyzing the sustainability issues of water management demand. The collaborative approach allows proactive measures to reduce the utilization of water and minimize the risk of water resource depletion, thereby promoting economic, social, and business excellence in the FB industry and the ecosystem.

Although 83% (20 of 24) of publicly traded companies in the food and beverge sector have reported their agriculture and water supply risks to investors and enhanced their sustainable leadership practices, some FB companies lack transparency in the integration of their sustainability reports (Ceres & Sustainalytics, 2014). This fact revealed a limited approach to sustainable water management practices that could affect a company's reputation and bottom line performance in an adverse manner (Scheven & Ceres, 2011). The southeast region of the United States represents a challenge toward water risks. Some of the countries that comprise the southeast region of the United States include Alabama, Florida, and Georgia which share their water intake. The formulation of policy to address water is an essential step in water management (UNESCO, 2013).

Problem Statement

Agriculture is a demanding water resource sector that consumes 92% of the global *blue-water footprint* (Hokestra & Mekonnen, 2012). However, of the 80% of freshwater consumed in the United States, 40% is effectively lost due as food waste (Hoekstra, Mekonnen, Chapagain, Mathews, & Richter, 2012; Natural Resources Defense Council, 2012). On the global scale, 33% of food is wasted, directly impacting local food production and water resource management (FAO, 2013). Contemporary water management requires addressing climate change, population growth, and waste management trends to avoid water scarcity and attain resource efficiency in the food and beverage industry (Mesa-Jurado, Azahara, Ruto, & Berbel, 2012; Ceres, 2015). The general business problem is the need for sustainable strategies to address global water management efficiency in the food and beverage industry in Georgia. The specific business problem is that some global supply chain leaders do not have sustainable strategies to address global water management efficiency in the FB industry in Georgia.

Purpose Statement

The purpose of this qualitative multiple-case study was to discover successful water strategies used by global supply chain leaders and water experts in Georgia to address water management efficiency in the FB industry. The study population consisted of global supply chain leaders and water experts employed by three multinational companies in Georgia, who managed their businesses in water-shortage prone areas. The study findings were designed to help other global supply chain leaders, and water policy makers gain a deeper understanding of the issues of water management efficiency, food

production, and waste management. Equally, the study findings created an awareness of the importance of adapting their business models and sustainability views to facilitate the decision-making process in attaining water efficiency and addressing future sustainability resource uncertainty.

From a social change perspective, it is essential to understand the emerging water-related issues that may affect freshwater sustainability for future generations. As a leader and citizen, I expect to help the community by exploring efficient water management practices and the critical role of business in society. Water conservation is necessary to achieve efficiency in resource management. Michelini and Fiorentino (2011) provided a method for the equitable distribution of potable water and water waste prevention in the community.

Nature of the Study

This qualitative multiple-case study was designed to explore the contemporary leadership practices of global supply chain leaders and water experts from three multinational companies in Georgia, and who managed their business in a United States water-shortage prone areas. A case study design was suitable for describing the actual strategic approaches of global supply chain leaders to address a complex issue such as water management efficiency in the food and beverage industry over other qualitative research designs (Ying, 2009). Ostrom (2014) highlighted that individual action was no longer effective at addressing an economic and social phenomenon like water management efficiency, and a joint action benefits participants for an equally favorable cause.

Managing a global and contemporary phenomenon such as water management is an issue that requires collective participation to address its understanding and system's complexity. A phenomenological design was not appropriate because of its focus on the intensity of the lived experiences of a phenomenon and not on how to discover the best strategic approach to addressing a contemporary phenomenon in a particular industry (Denzin & Lincoln, 2008). An ethnography design is suitable to study a culture or group of people (Yagi & Kleinberg, 2011), but was not appropriate for offering the desired multidisciplinary perspective on water management from three multinational companies. I selected a qualitative case study design for this study because it was suitable to addressing the research question's how and why prompts using interview questions.

Using the qualitative research method with a comprehensive multiple-case study design provided a holistic approach to exploring a contemporary phenomenon with the actual experiences and leadership practices of global supply chain leaders. I selected the multiple-case study design with a collaborative approach to provide a deeper understanding of water management efficiency, drawing on personnel at three different companies. This multiple-case study design was useful for capturing the multifaceted leadership actions of global supply chain leaders and exploring emerging water-related issues, in alignment with Yin (2011). Therefore, a multiple-case study design was useful in gaining an insight of how to efficiently address a key concern in the FB industry. Furthermore, a multiple-case study design allowed the exploration of the relationship involved in the global supply chain, to identify systems risk factors in attaining water management efficiency, concerning a particular industry.

Research Question

The primary research question investigated in this study was: What strategies do global supply chain leaders in the State of Georgia use to address water management efficiency in the food and beverage industry?

Interview Questions

1. Why strategic planning and environmental assessment is critical for your business sustainability?
2. How do you manage and mitigate water risks along the food or beverage supply chain?
3. How do you integrate the company's value-added activities with the country's water benchmarks in your region and the company's strategic planning implementation?
4. How do you manage water resources with other dynamic resources needed for bottom-line performance?
5. How global water management governance and knowledge collaboration influence strategic planning and water resource efficiency?
6. How do you cope with demographic and climatic trends at corporate and public policy levels?
7. How effective are your value-added managerial principles in attaining water management efficiency?
8. How effective is your company's strategic planning implementation at addressing complexity and managing risk along the supply chain?

9. How critical is waste management to your company?
10. How does your company's culture influence water management and strategic planning implementation?

Conceptual Framework

The hybrid conceptual framework for this study was based on adaptive management, systems thinking, and integrated water resource management. Adaptive management relates to leaders' awareness of the importance of adapting their business models to current global trends and risks to create new opportunities (Lawrence & Lorsh, 1967). Systems thinking enables global leaders to understand how the system works to approach complexity and uncertainty that otherwise will be difficult to attain without understanding the dynamic of the system and the subsystem's critical links (Drucker, 1962; Randall & Mello, 2011). Finally, the concept of integrated water resource management facilitated addressing a complex phenomenon by providing a road map while understanding and addressing complexity in a proactive manner (Global Water Partnership, 2010).

Operational Definitions

Arid and semiarid regions: Regions where there is water restriction for vegetative growth (Fensholt et al., 2012).

Autonomous adaptation: A concept used to indicate unstructured operations of diminishing risks generated by resource shortages and increased climate change (Forsyth, 2013).

Catalytic philanthropy: A novel approach useful to achieve transformational change with a collaborative effort to impact social issues affecting society (Kania, Kramer, & Russell, 2014).

Circle of Blue: A nonprofit organization with a global network; source exchange of water information and data related to the freshwater foreign crisis; and communications by scientists, design experts, and journalists (Circle of Blue, 2015).

Desertification: A form of land deterioration caused by an agricultural efficiency loss (Badreldin & Goossens, 2013).

Sustainable supply chain management (SCM): The strategic incorporation of the company's social, environmental, and economic goals for long-term financial performance and supply chains recovering (De Brito & Van Der Laan, 2010).

Sustainable production: In the context of this study, the efficient use of the earth's resources in a sustainable approach to prevent an irregular pattern in production. (Ridoutt & Pfister, 2012).

Water stress: A term used by experts to name a decrease in the water supply caused by excessive over-consumption, climatic changes, or poor water resource management practices (UNESCO, 2012).

Water footprint assessment (WFA): A measure of water consumption from a particular geographic area (Hoekstra & Mekonnen, 2012).

Water scarcity: The exhaustion and over consumption of water to extremely dangerous levels (Susnik, Vamvakeridou-Lyroudia, Savic, & Kapelan, 2012).

Assumptions, Limitations, and Delimitations

Assumptions

A qualitative method and case study design helped capture the multistrategy leadership processes of global supply chain leaders in the FB industry with a holistic approach concerning water management. Leedy and Ormrod (2012) defined assumptions as the necessary foundation of any research study. The following assumptions applied to this multiple-case study. The first assumption was that a qualitative methodology was a convenient method to explore the components related to the topic of water management efficiency. The second assumption was that the case study design was suitable for the study. The third assumption was that the participants in the multiple-case study would provide honest answers, an assumption supported by assuring the participants of confidentiality to encourage honest responses to the interview questions.

Limitations

Mitchell and Jolley (2010) posited that every study involves some limitations. A possible weakness of this qualitative, multiple-case study was that policy formulation in relation to the management of complex systems is evolving and shifting; therefore creating the need to look for novel methods for adapting policy formulation (Jager & Van der Vegt, 2015). The vulnerability of the U.S. water supply system makes water resource management a top priority for governments, society, and businesses (Gnavi, Taddia, & Lo Russo, 2015). A possible limitation of this study was that sustainability integration does not automatically occur in a collaborative manner between the government, the economy, and society in a socially responsible manner (Murray, Haynes, & Hudson,

2010). At the time of this study, there was limited quantitative information available concerning water management efficiency in the field of an environmental assessment (De Vries & De Boer, 2010; Moss et al., 2010). A paradigm shift should occur from an individual perspective to a joint-effort perspective and integrated water and risked management assessment because of the need to address the complexity involved in addressing the issue of water management (Mitchell & Jolley, 2010). The geographic limitation of time and funds and the lack of reliable information was also a potential impediment to interviewing participants.

Delimitations

Mitchell and Jolley (2010) defined delimitations as restrictions or boundaries that researchers implement to counter the role of study. The intent of this qualitative multiple-case study is to offer an exploratory view of the critical social, environmental, and economic elements that abide on the issuance of water management beyond just the previously individual environmental tactic. The multiple-case study presented a broader approach integration of the fundamental social, economic, and environmental aspects of food supply chain management. The environmental factors alone cannot support the overall view of the complexities involved in water management. Therefore, it was essential to explore the economic and social implications of addressing water efficiency and its links to the environmental factors in a proactive and collaborative manner.

In the multiple-case study, I discovered the practices and actions of effective global supply chain leaders to attain resource efficiency. A multidisciplinary approach and its connections provided a holistic understanding of the concerns for efficiency in

water management practices in the FB industry. I did not address the complexity involved in placing a value on water because there was limited empirical data to support that goal. Water policy development is necessary for water resource management to address efficiency. However, the emerging legislation to protect river basins withdrawal and control is an important topic to address since water conservation is a major step toward efficiency (FAO, 2012a).

Significance of the Study

This qualitative, multiple case study was designed to generate information that will help other global leaders in the FB industry become aware of the importance of managing a critical, sustainability resource for their businesses. Water is a key ingredient in food production and manufacturing in the FB industry, as well as, life-sustaining. Therefore, the finding of effective water management strategies in the industry could help other global supply chain leaders with the particular knowledge to improve their decision-making processes. Likewise, the discovery of effective water management practices could aid other global supply chain leaders to attain water management efficiency and decrease a sustainability risk in the industry. An assessment of the social behaviors involved in water management was useful in identifying the interrelation among the factors that affect the sustainability of water. An evaluation of the social behaviors could help the economy, society, and sustainability leaders adopt better management practices in the FB industry.

Contribution to Business Practice

Water scarcity is a global issue with significant business implications. Some global leaders in the FB industry have recognized that water scarcity is a sustainability risk to their business, supply chain management, competitive advantage, and profitability (Fensholt et al., 2012). People in more than 30 U.S. states share their water supply with Canada and Mexico influencing increased droughts, food production, and resource efficiency (World Overpopulation Awareness, 2015). According to the Food and Agriculture Organization of the United States (2012a), water pollution, and water scarcity is an increasing concern. Water management efficiency concerns are also durable and fluctuating. Water management efficiency is important to the FB industry because food and beverage production sustainability depend upon the efficient administration of the resource. Therefore, to achieve resource and business sustainability is critical to monitor the trends affecting its management.

There is a notable amount of water scarcity in the United States, particularly in the semiarid area of Georgia (Bastola, 2013). In northeast Georgia, there are also water restrictions for lawn watering (Fensholt et al., 2012). Georgia is a state that encourages water conservation. A decade of competition between multiple national users with different water supply needs from the Apalachicola-Chattahoochee-Flint River system adds complexity to the water management crisis in Georgia (Borden, 2014). Borden (2014) described water deficiencies in Georgia as embedded in a deficit in urban planning, infrastructure, and water policy development. Therefore, water resource efficiency is an important sustainability topic for study.

Freshwater crisis is a critical global issue. The global and emerging trends linked to water management are key factors at attaining water management efficiency. Canada's per capita consumer water usage is 759 liters per day, significantly higher than the per capita of 570 liters per day in the United States (Hoekstra, Aldaya, & April, 2011). Furthermore, in the manufacture of food and beverages, there are hidden negative and environmental social values (Hoekstra et al., 2011). The Circle of Blue is a nonprofit organization established in 2000 providing reliable information on the global freshwater crisis with different perspectives from prominent scientists, data experts, and journalists on water and its link to food, energy, health, climate change, and population (Circle of Blue, 2015). The information exchanged and associated with global and emerging trends, included: (a) the lack of water for irrigation, (b) water pollution, (c) water scarcity, (d) the rising cost of water, and (e) water usage per capita.

This study is important because it explored three different but fundamental standpoints; government, industry, and consumers. It was specifically designed to generate findings to help sustainability leaders and managers understand the dilemma of holistic water management. Water sustainability is a multifaceted subject in the FB industry, and the complexity involved in water resource management for the provision of food requires addressing water management efficiency with social responsibility, corporate ethics, and environmental accountability.

Implications for Social Change

The theory of sustainability has been increasingly adopted as an initiative for the integration of the concepts of supply chain management and risk management

(Chkanikova, 2012). The multiple-case study was designed to help entrepreneurs, managers, and global supply chain leaders attained a sustainable and holistic approach to food supply chain management by paying attention to the relationship dynamic within the system and its subsystem complexities. This information is intended to aid in the implementation of sustainability beyond the environmental value, and help adopt a better attitude on resource overconsumption for efficient and complex decision making within a worldwide spectrum. Although corporate social responsibility (CSR) presents many challenges, the concept creates an opportunity to shift from a single system level to food supply chains and networks sustaining the business economic performance in an ethical way (Hartman, 2011). Hartman (2011) posited about the importance of developing an awareness of the role of consumer attitudes and behaviors to accomplish the goal of responsible supply chain management as an additional opportunity to ethically improve supply chain management relationships along the entire supply chain.

A Review of the Professional and Academic Literature

The review of the academic literature began with an exploration of the universal concept of sustainability. I researched the concept of sustainability in water management in ProQuest as it was explored through qualitative, quantitative, and mixed methodologies in order to collect insight of the main sustainability issues regarding the FB industry. I also used Google Scholar, Walden University's library services, and membership resources from http://www.Deepdyve.com to narrow the topic to water scarcity, the main sustainability risk affecting the FB industry. However, the principal

goal of achieving sustainability is efficient water use and management. Therefore, the main topic that I selected was water efficiency in the FB industry.

I searched four databases to identify prospective articles and books: Business Source Complete, Emerald Insight, ProQuest Central, and Google Scholar. I searched the following keywords: *water, allocation*; *water, analysis*; *climate, changes*; *water, footprint*; *water, management*; *water policy, instruments*; *water, and scarcity*; *systematic review*; and *risk management.* I used the Boolean operators AND and OR to maximize the results. A total of 229 sources used in the study, of which 197 of 229 (86%) were current (five years from 2016), and 193 (85%) were peer-reviewed. Of the 147 sources employed in the literature review, 133 (90%) were peer-reviewed sources and 138 (94%) were current.

My review included research on the complexity involved in addressing water use efficiency and water allocation. Some of the quantitative studies provided an established method to quantify the use of water. In particular, Gerbens-Leemes, Van Lienden, Hokestra, and Van Der Meer (2012) and Halog and Manick (2011) investigated water allocation worldwide and reflected about the importance of its link to water use on a global scale. Water allocation on a global scale affects local food and beverage production; I searched for the terms *policy instruments* related to *water scarcity*, *climatic changes*, *efficiency*, *and adaptive management* to gain a holistic insight of the subject.

In this literature review, I aimed to explore with a global approach the importance of realizing efficiency in water use and management in the FB industry (see Appendix B). I divided the literature review section into eight parts and four key sections: (a) water

efficiency and integrated water resource management (IWRM), (b) the systems approach and water management, (c) food waste, water conservation, and the food supply chain system, (d) adaptive resource management (ARM), (e) the relevance of the participatory water management approach, (f) corporate social responsibility (CSR) and water governance, (g) agriculture and water management, and (h) sustainable leadership and adaptive management strategy.

Each section contains a discussion of subtopics related to water management efficiency. In the first section, I introduce the concept of water sustainability trends and gaps in the literature, sustainable supply chain management and value chain analysis, green supply chain, global and corporate water governance, and sustainability in water management. In the second section, I describe water management and scarcity and explore adaptive resource management and possible strategies to deal effectively with water efficiency.

In the third section, I discuss the concept of corporate social responsibility and key related water management aspects to consider in the industry such as food security, carbon dioxide footprint, multidiscipline and cultural water governance approach, social learning, water accounting and environmental impact assessment, and the stakeholders approach. Finally, in the fourth section, I introduce the concept of sustainable leadership and key trends in the industry such as innovation, food safety, and hygiene, changes in land and technology.

Conceptual Background

The purpose of this qualitative multiple-case study was to discover successful water strategies used by global supply chain leaders in Georgia to address water management efficiency in the FB industry. The first concept selected to support the multiple-case study is adaptive management. Adaptive management is a tool for addressing complexity by integrating continuous environmental assessment and ecosystem behavior impact within various decision-making approaches (De Leo & Levin, 1997; Dickens, 2012; Lawrence & Lorsh, 1967). Adaptive management provides a solid interdisciplinary basis for implementing organizational change and development in short-term phases (Hess, McDowell, & Luber, 2011).

The second concept adopted to explain the concern for water efficiency in the FB industry is systems thinking. Systems thinking is a universal and integrative approach to understanding the critical phases of a complex problem, particularly the different systems links with other related subsystems involved in water management (Bosch, Nouyen, & Sun, 2013). The general systems theory of Ludwig Von Bertalanffy (1968), father of the evolutionary systems theory, and Drucker's (1962) systems theory of the firm progressed into a systems of systems (SOS) theory of the supply chain management systems to address complexity (as cited in Randall & Mello, 2011). Gandhi, Gorod, and Sauser (2012) acknowledged the importance of addressing system risks and in understanding the interrelationship between its different constituents. Similarly, Bosch et al. (2013) addressed the need for diverse channels of thinking for managing complexity in a

responsible manner and in adopting effective management practices for long-term systemic results.

The complexities of water management require a balance within the relationships among the different supply chain functions to achieve resource efficiency (Randall & Mello, 2011). Pitasi and Pindaro (2014) highlighted the importance of creating a responsiveness to influence change; therefore, exploring how people interact with the whole system will support the vision of the organization as a social system. Treating the organization as a social system is possible by addressing the dynamic behavior involved along the entire food supply chain from agriculture to production, distribution, consumption, and waste (Reisch, Eberle, & Lorek, 2013).

The third concept selected to support this multiple-case study was integrated water resource management (IWRM). Integrated water resource management is a concept that foresees the feedback from multiple standpoints to facilitate the decision-making process related to water management. One critical aspect of the integrated water resource management concept is to focus on planning, controlling, and developing new water policies, regulations, and measures to address emerging complexities among different users in a collaborative manner (Global Water Partnership, 2010). Adaptation is critical to coping with water demand issues affecting future resource sustainability.

Using a multistakeholder and multidiscipline approach to addressing both natural and human aspects of water consumption may help to attain mutual benefit (United Nations University Institute for Water, Environment, and Health, 2013). Using multiple disciplines also enables global leaders to tackle water efficiency from different directions

with the sharing of knowledge. The integrated approach of water with other related resources such as land, energy, and food assist in attaining the goal of economic and social welfare without compromising sustainable development and impairing nature's systemic balance.

Water Efficiency and Integrated Water Resource Management

In this multiple case research study, I addressed the social, economic, and environmental effects of water management, with a systemic approach to highlight the importance of the role of sustainability in the future performance of the FB industry. Moreover, I discussed the relevance of adaptive management in supply chain management relationships. The cleaning of food processing equipment, lines, and surfaces consumes significant intensities of energy, water, and chemicals for pre- and postsanitation processes with a complex system to achieve efficiency depending on a multi-criteria approach to quality (Piepiorka-Stepuk, Diakun, & Mierzejewska, 2015). Therefore, the social, environmental, and economic integration of the sustainability dimensions may help develop socially responsible supply chains that serve to promote economic growth and keep in view an all-inclusive, collaborative system approach to SCM.

There is a gap in water management related to the holistic understanding of the sustainability issues and the drivers affecting water risk management. To address sustainable development and water management efficiency in the FB industry in a holistic manner, it is essential to provide an all-inclusive approach to water availability use by addressing quality instead of quantity. Fernandez-Esquinas and Ramos Vielba

(2011) recognized that water management requires cross-sector knowledge collaboration from different disciplines. Bielsa and Cazcarro (2015) identified gaps that need further monitoring in the implementation of IWRM, which involve reflecting on a change in governance and its relativity to the technical knowledge about water. Likewise, water management required collaboration with various viewpoints: (a) global leaders, (b) suppliers, and (c) consumers inside and outside supply chain management relationships.

However, Ceres, Roberts, and Barton's (2015) global case study of 37 companies in the FB industry identified water scarcity and water pollution as the FB's leading sustainability risk. Ceres et al. also identified water scarcity and water pollusion as key long-term global issues related to water use efficiency. Some countries are facing a geographical challenge to potable water and some critical and projected areas of the United States denote a challenge for FB industry leaders (UNDP, 2013). The amount of water used in agriculture and the manufacturing of products creates a sustainability concern link to efficient rainwater management, water recycling, and technology investments for improved wastewater controlling (NRDC, 2012). Those challenges are substantial and represent a risk to the FB industry's water sustainability needs, society, and the ecosystem (UNDP, 2013).

Furthermore, population growth and climate changes challenge leadership practices of water management in the FB industry. Global leaders in the FB industry must confront the challenges of population growth, urbanization, climate change, public health, and food security (UNESCO, 2012). Likewise, in exercising the role of supply chain management, global leaders within the FB industry experienced the challenge of

addressing the systems' complexity and recognized the relevance of long-term sustainable strategies for water risk management. Seuring (2011) commented on the sustainable need, to integrate the social dimension of supply chain management to discover the influence of social interactions on responsible supply chain management. The goal of attaining sustainable supply chain management depends upon the integration of the social aspect involved in supply chain management and in monitoring the impact on attaining ethical supply chain management.

The goal of attaining responsible supply chain management creates a unique opportunity for global supply chain leaders to improve risk management by focusing on increasing organizational value. Govindan's (2011) case study explained how manufacturing companies are increasingly concern for implementing environmental supply chain management (ESCM) in their efforts to reducing hazardous waste to the environment. Furthermore, socially responsible supply chain management provide global supply chain managers the opportunity to advance risk management initiatives with suppliers and other stakeholders focusing on value-added activities such as recycling, reuse, and waste reduction (Govindan, 2011). There is a need to incorporate sustainability with supply chain management for identifying new areas of research where value can contribute to improve supply chain management initiatives and waste management in society.

Some of the central issues involved in water management practices are water scarcity and droughts. However, water scarcity and droughts test sustainable leaders' abilities to achieve sustainability in water management practices (UNDP, 2013). As the

next sentence indicates, human overuse is not the only phenomenon causing water scarcity. The trend of other social and environmental forces such as climate change, urbanization, and population growth increase the issue of water scarcity. Furthermore, it is critical to understand that water scarcity is a phenomenon created by human overuse; droughts occurred when precipitation patterns and climatic changes impacted natures' water renewal activity (Hoekstra et al., 2012).

The traditional person-focused approach versus the contemporary all-inclusive approach lacked the needed effectiveness to define the value of socially responsible, green supply chain management (GSCM). The contemporary approach helped achieve adaptive management in real business practices (Ashby, Leat, & Hudson-Smith, 2012). Furthermore, water management is a global issue, and research collaboration may help policymakers, global leadership, and consumers' relationships approach to water management practices and risk assessment within a holistic coordination (UNESCO, 2012). A participatory approach to water management is an essential element to achieve better and sustainable ways of adapting to increase water availability needs (UNDP, 2013). Therefore, the attainment of the goal of efficiency in water management, depends upon the knowledge access to different disciplines, different viewpoints from diverse sectors and the related water resources link to other vital sources such as land, food, and energy.

Sustainability trends and gaps in the literature. The emerging practice of new sustainability sciences such as ecological economics, human ecology, and technology assessment has addressed the contemporary, multidimensional, and multiscale challenges

of water scarcity (Kastenhofer, Bechtold, & Wilfing, 2011). Kastenhofer et al. (2011) helped fill the gap between the social field, scientific investigation and community action. However, global supply chain leaders in the FB industry face new challenges that affect the sustainability of their businesses. These challenges involve more than an efficient management of natural resources (Devadas, Silong, & Krauss, 2011).

The integration of the concept of sustainability with the concept of supply chain management could be beneficial in attaining a needed integrative approach to supply chain management. Winter and Knemeyer (2013) set a model for future inquiry in green logistics within the environmental dimension, but their focus on sustainability and supply chain management needed an integrative approach. Winter and Knemeyer's (2013) assessment extended the knowledge of sustainability of supply chain management by applying the triple bottom-line approach and supply chain management elements in a systematic manner. However, the social aspect involved in understanding these relationships as a system approach to sustainable supply chain management was omitted. Verbeke and Tung (2013) highlighted the importance of stakeholder engagement for attaining advanced performance. However, an uncooperative, stakeholder support could affect a firm's bottom-line performance. Stakeholder participation and support is a key factor in attaining efficient and sustainable bottom-line performance.

Stakeholder pressure is not the only driver of sustainable supply chain management (SSCM; Wolf, 2013). Wolf (2013) analyzed SSCM from the perspective of the Resource Dependence Theory and showed that both SSCM and stakeholder pressure contributed to an organization's sustainability performance. However, from a stakeholder

activism perspective, there is more to do than just risk reduction such as human rights, animal welfare, value chain mapping, and supply chain ethics.

Consumer behavior toward water consumption is a significant factor in the capture of sustainability involved in water efficiency and risk management. A proactive behavior helps global leaders become aware of the growing trends of consumers and stakeholders' expectations (Ashby et al., 2015; Leat, 2012). Likewise, the beneficial participation of diverse systems could offer a combined knowledge approach with different specialists to address chaos and complexity (Espejo, 2013). Global leaders ought to become socially responsible for their business operations and demonstrate the quality of their environmental and ethical conduct (Espejo, 2013) because it could unfavorably affect their reputation and bottom-line performance. Espejo (2013) highlighted the importance of implementing an exemplary leadership style that reflected shared values, purposes, policies, and actions contributed to reducing systems' dysfunctional behaviors in water management and risk assessment.

Sustainable supply chain management and value chain analysis. A growing concern in the FB industry is toxic waste management. Liu (2015) presented a new logistics supply chain for food management to help reduce environmental toxic waste. Liu (2015) introduced a green way to manage logistics through the advanced environmental logistic theory that impacted the food supply chain system and market environment efficiently. The environmental logistic theory addressed environmental pollution in food supply chain management to reduce its impact in food logistics with a supply chain system that maximizes and prioritizes addressing key environmental issues.

But to improve food logistic is critical to enhance the efficiency of the supply chain at minimizing environmental footprint. By contrast, He, Huang, & Tarp (2014) conducted an empirical study and confirmed that clean development mechanism projects (CDM) contributed to global sustainability with strong policy suggestions for countries in development.

However, Harms (2011) inquired about the possibility of attaining cross-functional integration within an SSCM perspective and the concept of knowledge sharing to integrate both concepts and increase the interdependence of the relationship involve in attaining sustainable consumption. Morelli (2011) provided a definition of the concept of environmental sustainability by linking its understanding of human action and the related interdependence with the idea of sustainable consumption. But, Morelli (2011) discovered that the uncertainty among experts in providing a clear definition of the concept of sustainable consumption add additional complexity to its full understanding.

However, sustainable consumption and production (SCP) systems implementation are possible with greater stakeholder collaboration and engagement toward a shared vision of SCP to meet the needs of present and future generations (Staniskis, 2012). These findings suggest that a multistakeholder collaboration approach with a commonly shared vision of SCP could address overpopulation and overconsumption with a new cost-effective strategy for future generations. A shared vision will facilitate multiple collaborations that could provide a joint interest to address overpopulation and overconsumption in a pragmatic manner for the sustainability of future generations.

A misleading allocation of resources could interfere with sustainable development by impeding value creation and economic progress. Fearne, Garcia-Martinez, and Dent (2012) emphasized the importance to conduct a value chain analysis (VCA) to reduce the risk of strategic and operational misalignment within chains and the misleading allocation of resources. Scientific knowledge enabled leaders to use nature's resources efficiently; however, society's disruptive rate could affect water management efficiency in a threatening manner (Fearne et al., 2012). Therefore, scientific knowledge could be useful in attaining the goal of water management efficiency by increasing the knowledge awareness collaboration and understanding about using nature's resources more efficiently.

The overuse of the planet's resources could present a threat to the system limits in attaining the global needs of consumption and production. Staniskis (2012) reviewed various types of resource efficiency and cleaner production, as well as sustainable products and services in Austria, Bulgaria, Estonia, Lithuania, and Spain. From scientists' viewpoints, the goal to minimize environmental impact by adopting a sustainable growth strategy should also seek to achieve qualitative economic growth while helping preserve resource supply for future generations (Staniskis, 2012). Therefore, a supply chain perspective may help contemplate those unresolved issues in an innovative way and facilitate sustainable progress overseas.

Keller and Price (2011) emphasized that corporate leaders must undergo notable organizational transformations to improve their bottom-line performance. Furthermore, sustainability is a business plan that involves collaboration and information sharing

because it integrates other applications and practices for its successful implementation (Keller & Price, 2011). Likewise, International legislation and the rising costs of supply chain management have become compulsory subjects.

De Felice, Petrillo, and Gnoni (2012) proposed a decision framework to evaluate effective green supply chain management (GSCM) strategies. De Felice et al. (2012) proposed a framework that combines fundamental techniques for environmental performance evaluation (EPE) and creates a multicriteria representation rooted in the analytic network process (ANP). The ANP technique is a standardized and quantitative way to assess the environmental performance of the whole supply chain, including the suppliers' participation (De Felice et al. 2012). Consequently, suppliers might play a central function in the total supply chain. Global leaders could take into consideration the suppliers' impact on the company's reputation for the implementation of effective GSCM strategies.

Effective supply chain management (SCM) is critical to achieving superior financial performance (Greer & Theori, 2012). Supply chain integration (SCI) relates to both operational and business performance. However, supply chain management could become a complex phenomenon when it pertains to financial performance indicators because it involves the complex analysis of other relevant variables such as obligations and cost ratios (Greer & Theori, 2012). Greer and Theori (2012) proved that effective supply chain management (SCM) helps improve business performance, and that stakeholders learn how to become more supplier- and consumer-oriented. However,

stakeholders' collaboration is critical to impact the different levels of supply chain integration.

Green supply chain management. Green supplier development is necessary for environmental supply change management. Sustainable supply chain management is the strategic incorporation and visible attainment of an organization's social, environmental, and economic goals for financial performance, and supply chains improvement (De Brito et al., 2010). However, Beske (2012) recommended an innovative framework that linked sustainable supply chain management (SSCM) with the concept of dynamic capabilities and proved that its integration and implementation could benefit the three scopes of sustainability.

By contrast, Blome, Hollos, & Paulraj (2013) contradicted the legitimacy theory and proved that chief management assurance is a crucial driver of green initiatives and green supplier development, and concluded that both practices are essential for green supplier development. Blome et al. (2013) study found that market performance directly impacts the adoption of green initiatives and not financial performance as previously thought. Therefore, is critical to acknowledge the demand for multiobjective and multidisciplinary research and focus on sustainability impact assessment at all levels in the supply chain.

Pinal (2012) used the managerial concepts of complexity, ecological modernization, information, systems, resource-based view, resource dependence, social network, and stakeholder to address some multifaceted concerns about GSCM. Pingali (2012) showed a broad presentation of the green revolution (GR) method. The Green

Revolution is an integrated approach to the environmental, and social impacts merged with agricultural and economic growth and key policy directions, toward a more sustainable adoption of improving productivity and technologies.

Green marketing is improving the natural ecosystem but is not attaining the sustainability goal of improving the quality of life of consumers (Polonsky, 2011). The failure is in the lack of integration between consumers, firms, and government to adopt the systems thinking. Polonsky highlighted the importance of mind modification to achieve a paradigm shift and encourage consumer, business, and government behavior change. However, Peano, Tecco, Dansero, Girgenti, and Sottile (2015) case study demonstrated that the real challenge in the implementation of the concept of sustainability laid in understanding the complexity of the agricultural food systems. Therefore, Peano et al. (2015) recognized the need to design eco-friendlier alternatives that will aid in the strategic management of complex systems.

However, the internal and external strategic integration of a multinational's supply chain could affect their operational and financial performance. Ralston, Blackhurst, Cantor, and Crum (2015), posited that global companies could attain internal and external supply chain integration with suppliers and customers' demands, the firm's strategic planning implementation, and the firm's bottom-line performance. Ralston et al.'s (2015) case study provided pragmatic and academic evidence that extended the knowledge of previous research in the field of strategic, supply chain integration.

Global and corporate water governance. The contemporary model of the multinational enterprise serves as coordinator of supply chains. A unique model of

international industry facilitated the contemplation of unanswered issues in international trade theory (Casson & Wadeson, 2012). The issue of water management involves addressing the effectiveness of supply chain management relationships at a global scale (Casson & Wadeson, 2012). Casson and Wadeson applied a new way of replicating international business as a supply chain system, and they created an awareness of the unresolved issues left behind in addressing the issue of water management.

Sustainability in water management practices. The complexities involved in the implementation of water management practices require the use of flexibility and the application of strong disciplinary boundaries that facilitate efficient handling (Birkin & Polesie, 2011). Galpin and Wittington (2012) identified a gap in the field of sustainability and corporate sustainability about how leaders implement an enterprise sustainability strategy among their organizational members. Gaetno (2013) introduced a systematic approach to understanding the complex phenomenon. The interdependence between systems, along with a systems approach, and the leader's capacity to adapt to change can form a collaborative alliance to address and cope with water scarcity, an emerging issue in water use and management (Cook & Bakker, 2012; Gaetno, 2013). The qualitative multiple-case study combined both SOS theory, adaptive resource management, and integrative water resource management (IWRM) could offer a reliable, holistic framework for exploring, describing, explaining, and understanding the issue of water management at short-term and long-term scales.

When the capacity of the system to adapt to the changes in population growth is beyond the systems capacity, water depletion, as well as, water scarcity is a possible

outcome (FAO, 2011). The concept of sustainability within the field of water management relates to the amount of freshwater available for human use and the ecosystem (Marshall, Robles, Majka, & Haney, 2010). Water is an essential resource for social sustainability, food security, the sustainability of companies in the FB industry, and the ecosystem (Committee on World Food Security & High-Level Panel of Experts, 2014). According to the Dieuwerke, Lakemond, de Wijik, Luning, and de Graaf (2013), increased water consumption about drinking proportions leads to underestimation of the quantity consumed. Therefore, water scarcity represents a challenge to the sustainability of everyone in the ecosystem: (a) the government, (b) businesses, (c) individual consumers, and (d) the community.

OCHA (2010) highlighted sustainability concerns about the water consumption practices and water supply among some global competitors in the industry. Furthermore, economic, legal, demographic, environmental, and technological factors add complexity to the direction of the issue of water scarcity. Likewise, those factors shape the humanitarian and the strategic corporate action in the industry (OCHA, 2010). Water scarcity is a sustainability risk in the FB industry, and its management value relates to both social and economic issues.

Risk assessment is a core factor in the beverage industry. Kampragou, Apostolaki, Manoli, Froebrich, and Assimacopoulos (2011) emphasized the importance of engaging in risk management assessment and practice. Kampragou et al. (2011) exposed gaps for the enhancement of the drought policy management at all levels of governance. Moreover, the complexity involved in water management embodies a threat to the

economic performance of countries and corporations and further affects the ecosystems and society's well-being (Kampragou et al., 2011). Therefore, a combination of methods that integrate the knowledge from many disciplines could be helpful in addressing the complexities involved in water sustainability assessments.

The Systems Approach and Water Management

The contemporary interpretation of the system of systems (SOS) concept highlights the complexity involved in the relationship pattern that is always changing (Artan, 2011). In contrast, the traditional grounded theory approach integrates the organization and individuals by providing a way that recognizes categories and links to key individuals and organizational variables in a proposed framework (Randall & Mello, 2011). Toretta (2014) communicated the importance of river basin management in addressing quality in water resource management and indicated the need to develop a plan to attain its sustainable use. Therefore, the contemporary approach of SOS could help explain and become aware of other critical systems involved in water management that did not previously consider in the decision-making planning to achieve water resource efficiency.

Halog and Manik (2011) encouraged the need for an integrated, methodological framework for sustainability assessment. The method was systems oriented, integrative and provided a holistic approach to sustainability assessment linked to science, technology, and policy formulation. Halog and Manik (2011) are implemented life cycle thinking methods such as life cycle analysis (LCA), sustainable life cycle analysis (SLCA), stakeholder analysis, and dynamic systems modeling. The implementation of

the systems dynamics or agent-based modeling analysis introduced new opportunities to integrate knowledge across the segregated social, natural sciences, analytical, and problem-solving research (Halog et al., 2011). However, Savenije, Hoekstra, and Van der Zaag (2013) indicated that the significant human alteration to water's natural flow produced immediate consequences on its balance and management. Therefore, creating the need to examine the systemic understanding of water governance.

One critical aspect of water governance is risk reduction. Risk reduction is an essential element in sustainability implementation. However, the systemic understanding of water governance is essential to achieving both short-term and long-term water efficiency. Moreover, purchasing and supply chain management (PSM) relate to the roles of sustainable water and risk reduction.

Food Waste, Water Conservation, and the Food Supply Chain System

Efficiency in water use and management is critical to secure food and drink production in the industry (UNESCO, 2012). Consequently, the implementation of best management practices for the recycling of water and waste management should provide for the implementation of sustainable productions in the FB industry (Ceres, Roberts, & Barton, 2015). According to the World Economic Forum (2015), freshwater accessibility crisis rated as a global chief risk. However, the overconsumption of water, decreases the chances of attaining water management efficiency in the FB industry, and may aggravate the supply of water for future generations. The implementation of proactive strategic measures; along with product, process, and technology innovation may help reduce the

water management-related risks in the business and help contribute to achieving community and environmental sustainability.

The topic of food waste relates to water management efficiency. Forty percent of food production in the United States is wasted, impairing water management efficiency and the ecosystem (FAO, 2011). This suggests that supply chain leaders can explore the entire food supply chain system's performance to improve waste management and improve the ultimate goal of water efficiency in the FB industry.

In a world of limited resources, water is essential for food production. However, it is critical that global supply chain leaders address the issue of food waste to improve water conservation and water management efficiency in the FB industry. One essential aspect in attaining water management efficiency is by encouraging water conservation practices. Therefore, an assessment of the amount of water needed for food production is vital in reducing water use and in attaining water management efficiency.

Since, agriculture is a water-intensive sector of the economy, rainwater management could be a possible sustainable strategy to water management (Angrill et al., 2012). Duarte, Pinilla, and Serrano (2011) were the first to explore the relationship between water use tendencies and economic development from a long-term standpoint. There is still the need to inquire towards future projects on water management trends and adapt the FB industry's business models to achieve the goal of water management efficiency.

Likewise, monitoring demographic trends plays a significant role in food production and attaining water management efficiency. The increase in population

impacts food production and raises awareness toward managing food production and waste as a health concern, as well as sustainability with efficient management of water (Marchetto, 2014). However, Irshad Mari, Hae Lee, & Saad Memon (2014) study introduced an innovative network optimization model for sustainable and robust supply chain network to recognize the importance of managing disruptions and risks. The unexpected disruptions in supply chain represented a challenge to global supply chain leaders that can impede the sustainability of the food chains (Shad Mari et al., 2014). Therefore, the link between food production and waste management needs future research to addressing the complexity in attaining the goal of water efficiency without affecting future sustainable environmental, social, and economic development.

Moreover, human practice is a topic of relevance in attaining water management efficiency. Savariar (2014) highlighted the need for a pragmatic approach to water management. System monitoring is a requirement to attain a balance between waste management and production (United Nations, 2013). Savariar (2014) determined that water use and management in agriculture require a joined economic and cross-sectorial approach to finding new alternatives for improving resource efficiency in the FB industry. Likewise, the World Bank Organization (2014) identified water use in agriculture as a global challenge in the 21st century resulting from severe climatic changes.

Adaptive Resource Management

Adaptive resource management could be a possible business approach, to manage ambiguity, changeability, and the multifaceted ecological systems that need a global

approach in behavior modification (Allen, Fontaine, Pope, & Garmestani, 2011). Hoekstra (2014) originated the multifaceted global water relations required for engaging in water management. The model offered relevant data for policy formulation and the decision process about water management. Moreover, Rogers et al. (2013) posited the need to foster a framework deep-rooted in the concept of complexity thinking, as a tool for joint planning and adaptive decision making for researchers, stakeholders, and decision-makers to address complex community and environmental systems.

The key element in adaptive management is to identify and reduce uncertainties within an organized approach to encourage learning from experience. De Boer, Bressers, Ozerol, and Vinke-De Kruijf (2013) commented on the importance of collaboration in water resource management and real corporate governance. However, a key factor in the improvement of sustainable business initiatives in the FB industry is how to influence consumers' actions toward better water management practices in the marketplace.

Bastola (2013) conducted an assessment of 28 watersheds in the Southeastern part of the United States, against the output of global climate models (GCMs) and proved that the variations among the watersheds in the wetness index made complex to implement adaptation measures. The test of climate models showed a challenge for the 21st century about further and extended dryness and droughts (MacDonald, 2010). MacDonald (2010) argued that there is an increased interest in food security and water demand as population growth increases, creating a serious risk for rural sustainability. Since agriculture used more water than other sectors of the economy; MacDonald (2010) highlighted the importance of planning, collaboration, and incorporation efforts involving an increased

multispectral commitment higher than in the past century to meet the 21st century's sustainability. Booth et al. (2012) posited the importance of identifying and monitoring climate sensitivities for future predictability and adaptation strategies. Policy formulation should consider the critical topics of water scarcity and drought.

Kampragou, Apostolaki, Manoli, Froebrich, and Dionysis (2011) mentioned the dilemma of drought risk. The complexity of the problem is not only in the industry but also in the local and regional economies in the United States. Kampragou et al. (2011) suggested a paradigm shift from an emergency perspective to proper risk management to reduce the social susceptibility to droughts. In contrast, Li, Huang, Nie, and Chen (2011) evaluated water policy management and connected its value with Hoekstra's (2013) water footprint metric to distribute and identify sustainable farming methods. Furthermore, Li Huang et al. (2011) considered the uncertainty involved in water resource management and the successful implementation of sustainable designs in agriculture.

Randall and Mello (2011) commented on the significance of addressing the sustainability of the subsystems within the whole supply chain to achieve a holistic approach to achieving the goal of sustainability. Sanchez, Ruiz, Lopez, and Perez (2011) argued that effective water management in the agrifood industry depends upon the use of financial incentives. More industries in the beverage sector are implementing innovative technologies in agriculture that use water efficiently and in lower quantities to minimize consumption without impacting production (Sanchez et al., 2011). The use of incentives

may help promote cost-efficient technologies that address the concern of efficiency, and affect production in a favorable manner.

Wetland management and water supply assessment are fundamental aspects of water management. The trend over the past decades, to use European wetlands for agricultural functions, endangered the ecological value of water management practices in the Elbe Lowlands, Spain (Dietrich, Steidl, & Pavlik, 2012). Dietrich et al. (2012) noted that the analysis of the European wetlands is fundamental to measure the water residue of many river basins. Climate change can affect the ecosystem water equilibrium in a negative manner. The assessment of seasonal precipitation patterns may represent a threat to future wetlands and water supply management, and may be another dynamic aspect of dealing with water management and scarcity.

The water balance model (WBalMo) for water equilibrium analysis is an appropriate tool, to address the facets of water balance and water management in the wetlands, and water equilibrium and control management integration (Dietrich et al., 2012). The model offers an integrative approach to the climatic, socioeconomic, and hydrological models, which provide a holistic approach assessment to different water users of the Elbe River Basin. Dietrich et al.'s (2012) assessment of the impact global development by industry, agriculture, and wetlands users underlined a water extraction scarcity by 2050.

Bell, Mollenkopf, and Stolze (2013) provided a theoretical framework to reveal industry leaders' reactions to the growing threat of natural resource scarcity within the role of closed-loop supply chain management. Bell et al. (2013) made an original

contribution to academic research by integrating natural resource scarcity and closed-loop supply chain management. Furthermore, Bell et al.'s (2013) study had valuable managerial implications related to supply risk and planned disruptions initiated by a resource deficiency in current and future supply chains.

Resource exhaustion is gaining attention in some industries, and its effective management can help reduce its negative implications for the long-term sustainability of the businesses. Gohari, Eslamian, Mirchi, Abedi-Koupaei, and Massah Bavani (2013) developed systems dynamic model to obtain the interrelationship of various systems among different subsystems. For example, the development of policy options could improve the situation of the river basin rather that the reliance on increase water demand and transfer that will bring other catastrophic consequences to the governing body. The river basin model is a way to examine the system for the sustainable use of resources. New policy development may reduce the risks of unexpected effects and control the activity of the organization.

The demand for water as population increases can result in water supply shortage and could become a threat to human sustainability and sustainable development. Therefore, the approach policy makers previously used to address the phenomenon of water scarcity had fallen short and lacked sustainability. For example, the methods of desalination, groundwater recharge, wastewater reuse, and massive water transfer projects lack sustainability and cost efficacy. Gohari et al. (2013) indicated that unsustainable decisions intensify the phenomenon of water scarcity by unexpected issues caused by excessive water demands. This unfavorable situation occurs when there is a

need for the understanding of the linkage inside the dynamics of different subsystems of multifaceted watershed systems.

Water resources management is a complex subject to discuss because it includes interrelated topics that are impossible to address in a study. However, it is essential to becoming aware of those relationships to provide a deeper understanding of water efficiency and to identify topics of significance for future research. Ram, Corkindale, and Wu (2013) study proved that the critical success factors (CSFs) affect the successful implementation of Enterprise Resource Planning (ERP) system project. Adaptation is an important aspect of risk reduction that relates to resource scarcity, environmental change, or the effects of climate change (Ram et al., 2013). Therefore, planning could become a proactive measure to minimize water risk and increase adaptation.

Forsyth (2013) described autonomous adaptation as an idea used to illustrate unstructured acts of minimizing risks created by resource scarcity and progressively more climate change. Moreover, Forsyth emphasized the importance of performing adaptation planning to recognize the different experiences of danger and the socioeconomic barriers to adaptation. Sustainable global supply chain management needs to address supplier ethics at an economic, social, and environmental scope to be able to minimize risks, address change, and promote social sustainability.

The Relevance of the Participatory Water Management Approach

An important aspect of dealing with the issue of water efficiency is to observe what is taking place in semiarid and arid regions worldwide. Groundwater levels, water logging, and salinization in canal irrigated areas have become a serious problem that

affected crop production in India (Singh, 2013). Singh evaluated alternative scenarios to promote water classification and groundwater model analysis in India. The design may prevent future colonization of the region by increasing groundwater withdrawal, better water supply in alignment with crop needs, and the manipulation of surface irrigation systems. Singh introduced a tool for groundwater imitation that could become the basis for future water management plans.

By contrast, the behavioral theory could help explain the current lack of integration in achieving the goal of sustainability along the entire supply chain management's relations by understanding the motivation and actions of those interrelationships. The previous research emphasized the relevance of incorporating sustainability issues into supply chain and operations management (De Brito & Van Der Laan, 2010). De Brito & Van Der Laan (2010) case study, from a system's standpoint, offered a contemporary pattern and sustainable approach to supply chain and operations management issues.

The participatory approach not only facilitated gathering critical expertise knowledge, but also create an awareness of the importance of learning from an integrated knowledge perspective. Among the benefits of the participatory approach, are an effective decision-making process, approval, and participation; cross-sector collaboration; social learning; and increase critical thinking and evaluation before adopting any implementation process (Von Korff et al., 2012). However, the participatory approach needs to provide a common problem-solution combination (Hommes, Bressers, & Kutscher, 2009). Barged and Thomas (2012) identified the need

for future participatory research and encouraged the concepts of safe space, participation concerns, and ethical inquiry paying attention to ignored areas.

Corporate Social Responsibility and Water Governance

Global leaders' sustainability performance behaviors indicate the method by which global companies effectively develop and integrate their triple-bottom-line initiatives (Fontaine, 2013). Global leaders in the industry offer their views on practical initiatives to reduce water consumption across their value chain and life cycle assessment of their products. According to Accenture and CIMA (2011), corporate social responsibility provides a framework for creating a virtuous cycle for exceptional sustainability performance, management, and to drive greater business value. The Beverage Industry Environmental Roundtable Report (BIER, 2011) provides a network of diverse collaborative perspectives, insights of the beverage industry. The BIER Group evaluated different footprint methodologies to prioritize their water risks from a business perspective (BIER, 2011).

Global companies adopt corporate social responsibility initiatives for various reasons. However, several corporate social responsibility initiatives failed because management teams were not aware of how these factors related to their business strategies. Galpin and Wittington (2012) revealed the deficiency in the sustainability literature for a comprehensive framework that matches the existing gap and incorporates the essential elements involved in corporate social responsibility. This factor could be decisive in the successful implementation of the concept. However, in the evolution of the concept of corporate social responsibility, global leaders recognized the value of the

notion of diverse learning views as a legal disclosure compliance, a competitive advantage, and as an integral part of a company's culture.

Employee engagement is a fundamental element for the successful strategic implementation of the concept of water sustainability. Galpin and Wittington (2012) demonstrated weaknesses in the literature by indicating how to change a formerly developed all-inclusive model of employee engagement for the performance of a complete sustainability strategy. The sustainability leadership model provided a framework for the formulation, completion, and successful implementation of sustainability initiatives with employees' participation (Galpin & Wittington, 2012).

Water management and food security. Some researchers in the field of water sustainability agree that an innovative research method, that addresses global food security and water management is fundamental to address water efficiency (National Science Foundation (NSF), 2014). Most previous researchers in the area of corporate social responsibility (CSR), highlighted the increasing pressure from stakeholders to make companies integrate the triple bottom line social, environmental, and economic enterprises into their daily operations and supply chain management activities. For example, Voiculescu (2011) conveyed a different approach of CSR framework at an international level. Voiculescu recommended a normative of light and rigorous regulatory mechanisms that facilitated the United States with the economic, trade, and human rights policy integration from different CSR frameworks. The acquired knowledge from various disciplines could provide a holistic view of the concept of water efficiency.

Water and carbon dioxide footprint. A challenge that required additional attention in addressing the issues of effective water resources management were the issues in carbon dioxide emissions. Court et al., (2012) demonstrated the emerging challenges of water management in carbon dioxide capture projects that required further attention in all carbon dioxide operations. Court et al. (2012) identified valuable collaborations and options to address the stabilization of the carbon dioxide and the atmospheric footprint with a practical approach to the active management of water resources. Therefore, according to Court et al.'s assessment, water management, legal, and public acceptance issues required research attention and cooperation to take advantage of different viewpoints and partnerships. Therefore, the link to water with energy, land, and food production is a key technological aspect in achieving efficiency in water management practices in the FB industry.

A multidiscipline and cultural water governance approach. Hartman (2011) reviewed the evolution of 15 years of research on the impact of the concept of corporate social responsibility on consumer attitude. Kampragou et al. (2011) alleged that to achieve an insight of the company business models and sustainability views; it is critical to establishing a conceptual sustainability framework of the firm's supply chain management. Therefore, water management is an interdisciplinary subject that relates to the study of many other disciplines such as hydrology, chemistry, ecology, geomorphology, climate science, economics, law, sociology, and political sciences.

By exploring the role of business in the community, researchers provided a different perspective in the understanding of the concept of CSR. For example, Brammer,

Jackson, and Matten (2012) explored the concept of CSR as a mode of governance with the political determinants and patterns that made companies adopt social responsibilities. Mc Donald and Young (2012) highlighted that corporate social responsibility has become an important process to find an equilibrium between the needs and expectations of the job and the stakeholders. Furthermore, global leaders' CRS initiatives required cross-sector collaboration for its successful implementation (Mc Donald et al., 2012). Cross-sector collaboration may become an alternative to address the emerging issue of water scarcity at a global scale.

Galpin and Wittington's (2012) reflection of the literature on sustainability and corporate social responsibility revealed a research need to focus on how leaders perform an enterprise sustainability water efficiency strategy among their organizational members. The members of the Food and Agricultural Organization of the United Nations (2012) commented on the importance of investing in sustainable agricultural systems that are socially and environmentally sustainable and motivated by financial incentives. Likewise, effective supply chain management (SCM) is critical to achieving superior financial performance on water assessment and management (Greer & Theori, 2012).

Corporate social responsibility is not solely an individual, organizational practice; it is a cultural approach that requires the participation of various bodies across the supply chain to achieve social responsibility. Roy, Boiral, and Paille (2013) discovered differences among the ISO 9000 and 1400 certification SMEs. Roy et al. (2013) provided relevant empirical data to guide many SMEs addressing environmental challenges and help their business leaders understand the results of their environmental decisions. Global

leaders used different resources and implemented different types of actions to address their environmental concerns within a defined cultural environment.

Social learning in the food and beverage industry. The practice to report the sustainability initiatives, increased because of product claims, consumers, market demands, governmental and the non-governmental organizations (NGOs) Stakeholder Collaborative organization called the Sustainability Consortium (TSC). The consortium's primary goal was to provide a standardized framework for communication of sustainability-related information throughout the product value chain and relevant data to support the company's platform for sustainability across their supply chain management. Social responsibility information has become increasingly and engaged topic for many consumers in the FB (Dooley, Carlson, Schoner, Subramanian, & Childs, 2011).

However, other researchers view water management as a value focus on the expenditure of the household, agriculture, and the industry instead of the amount used after a time (Fisher & Huber-Lee, 2011). Fisher & Huber-Lee (2011) showed a different approach to water conflict through the MYWAS Allocation Model to prove the amount demanded at various prices. This type of planning involved assigning a cost to water users, which could be another alternative to avoid the risk of water scarcity in the FB. Therefore, several companies in the soft drink industry may consider the need to adopt more sustainable agricultural methods to reduce their water footprint. Failure to accomplish this critical goal will affect the efficient production, the sustainability of their products and the ecosystem.

Water system management linked to the value of water footprint could help allocate and define more sustainable farming methods. In the same manner, nutritional security, quality, and sustainability of food production throughout the entire supply chain is an important challenge to the value of water in the F&B industry. Previous studies examined the issues of planning and water management but omitted social learning, a decisive factor in minimizing the risk of water scarcity (Marshall, Robles, Majka, & Haney, 2010). There is also an increasing awareness towards environmental and natural resource management literature for learning-based advances focused on testing and philosophical practice (Rodela, 2013). Moreover, many experts in science and policy supported a paradigm modification in water management. The recommended paradigm shift was from a normative and descriptive view to a more adaptive with social learning (Pahl-Wostl, Jeffrey, Isendahl, & Brugnach, 2011).

Pahl-Wostl et al.'s (2011) fundamental discovery were the need for critical reflection in the implementation of innovative, management approaches. Their research contributed to a better understanding of water management practices and other strategic methods leading future research and analysis. By contrast, Ayele, Duncan, Larbi, and Khonh (2012) highlighted the importance of integrating the useful features of the value chain approaches and innovation systems to improving smallholders' innovation and market success. Ayele et al. (2012) examined the implementation of fodder technologies in various livestock productions in Ethiopia, Syria, and Vietnam. In some developing countries, livestock production is a vital factor for food security and the sustainability of the economy.

Zhao, Cai, and Wang (2013) discussed water consumption behavior through the consistent agent-based modeling framework for water allocation analysis. Zhao et al. (2013) compared the water user's behavior throughout administering systems (AS), and market-based systems or a combination of both for water distribution analysis to improve the water allocation equilibrium. During water stress situations, the agents' behavior will depend upon water supply and trading prices, water use violations, and penalties for the efficient administration and cost allocation. Therefore, one way, to address the emerging issue of water scarcity, could be through the agent-based modeling, the market system, or a combination of both measures for proper water equilibrium measures.

Water accounting and environmental impact assessment. Water accounting and environmental impact assessment alongside a product lifecycle is two critical aspects of water risk calculations that are increasing its value in the industry (Jefferies et al. 2012). Jeffrey et al. 2012 presented two case studies by validating between two approaches: (a) the Life Cycle Assessment (LCA) and (b) water footprint (WF) to different products. The water footprint assessment is a reliable method to identify those geographical areas where there is an excess of water use and, therefore, a potential risk for water scarcity.

Both methods contributed to the betterment and promotion of water resource assessment in food production. Thus, both methods are relevant to the understanding of water management. The work of Hokestra and Mekonnen (2012) explained the central point in human water consumption and stated the importance of knowledge in water management research.

Another critical aspect of addressing the issue of water management and its related sustainability risk in the FB is gaining environmental experience. Constanza and Hermman (2012) highlighted the need for the integration of the environmental and social-cultural dimension to achieve efficient biodiversity conservation goals. Constanza and Hermman (2012) conducted a case study analysis of the Sariska Tiger Reserve to look at Etna-zoology and community-based conservation initiatives within sensitive ecosystems in northern India to ensure biodiversity maintenance and utilization. Constanza and Hermman (2012) findings revealed the complexity involved in community conservation efforts and provided authoritative answers for the implementation of biological diversity strategies in both ecological and social-cultural dimensions. The incorporation of local and scientific knowledge is vital to address the problem of water management in the FB industry with a multidisciplinary approach. Furthermore, Constanza and Hermman (2012) confirmed the importance of cognition and collaboration in the implementation and understanding resource, management, and conservation efforts in the community.

Stakeholders approach. Human behavior is crucial to the understanding and administration of water management practices in FB industry. Clifton and Amran (2011) reflected the stakeholder approach (SHA) to organizational management through a human perspective on sustainability. Some companies faced increased pressure from various stakeholders about their corporate responsibility initiatives in the marketplace. Business entities faced many legal claims and demands in such an elaborate economic evolution. Boutillier (2012) commented that the application of the stakeholders approach

rooted in the dynamic ability of an organization to create networks and form coalitions to address a shared issue with empirical research that support their strategic approach.

Agriculture and Water Management

The control and allocation of water could be the foundation of water resource management under complex climatic conditions. Forouzani and Karami (2011) scrutinized the role of sustainable water management and proposed the agricultural water poverty index (AWPI) assessment tool to facilitate the holistic representation of vital issues of sustainable water management. Water scarcity embodies a challenge to achieve the goal of sustainability in agriculture. Forouzani and Karami (2011) provided valuable recommendations for sustainable water management. The agricultural water poverty index is a useful tool used to assess the agricultural water poverty between farmers and regions and in offering guiding principles for sustainable water management.

The quantity and damage to global water quality make the use of water resources diminishes at a critical stage. It is vital that farmers acquire high-quality experience in irrigation and water use practices, depth, and the interval between irrigations, and superior cropping systems particularly in semiarid environments (Forouzani & Karami, 2011). The lack of control and cost allocation of water might represent a challenge to achieve the goal of water conservation and reduce water scarcity in the FB industry. The challenge involved in water supply for irrigation under complex scarcity conditions is pivotal to address additional complexities in managing the aspect of water scarcity

According to Mesa-Jurado et al. (2012), water shortages embodies a challenge to conventional requisites in agriculture in the south of Spain. Mesa Jurado et al. (2010)

corroborated that when water is scarce farmers had nonmarket values correlated with an increased guarantee of direct use and delivery of water. By contrast, Soto-Garcia, Martinez-Alvarez, Garcia-Bastida, Alcon, and Martin-Gariz (2013) conducted an evaluation of the dynamic of irrigation in different districts and found the unfavorable effects of modernization on water consumption. Soto-Garcia et al. (2013) created an awareness of the drivers that contribute to the exacerbation of the phenomenon of water scarcity such as overpopulation, economic and social developments, urbanization, and irrigation.

Global leaders need to develop an understanding of the drivers that impede achieving efficiency in water conservation practices and management. Lopez-Gunn, Zorilla, Prieto, and Llamas (2012) focused on explaining the links between water efficiency in water rights and allocation, benefits, and the benefactors from water conservation. Lopez-Gunn et al. (2012) emphasized the mutual benefits of modernization and the development of agricultural policies. The water efficiency approach at a macro level addressed the central role engagement of agricultural, and energy systems as the primary drivers for long-term feasibility (Lopez-Gunn et al., 2012). Lopez-Gunn et al. (2012) explained the fundamental knowledge associated with achieving water efficiency and quality of life.

In the formulation of policy, government, global leaders and the members of society need to look at the economic and environmental concerns for a holistic approach to their implementation; otherwise, the process may fail. Howitt, Medellin-Azuara, MacEwan, and Lund (2012) conducted an empirical policy analysis for the California

Statewide Agricultural Production Model (SWAP) of irrigated agriculture. California's irregular rain patterns throughout the year create a water sustainability challenge since the surface water storages come only from the rain in autumn and winter (Howitt et al., 2012). The precipitation flow out to the Pacific Ocean creates an imbalance that will not support two-thirds of the state's population using the state's fresh water supply (Howitt et al., 2012). Therefore, the SWAP model of irrigation helped with the assessment on climate change fluctuations and efficiently determined the water changes that affect California water management.

Furthermore, the model evaluates the prospective water transfer under drought conditions in that geographical area and makes an affiliation with local production functions and the water supply network. The model could also help evaluate the other regions and weather conditions of the California environmental and agricultural water system. Howitt et al. (2012) emphasized the importance of integrating economic and environmental concerns for the formulation of public policy.

Lee, Gereffi, and Beauvais (2012) employed a value chain approach to explaining the correlation between value chain organization, safety, and quality in agricultural standards. The suggested framework focused on two dimensions of the system: (a) the relative importance of public and private standards and (b) safety and quality standards. However, leading firms in agrifood standards, retailers, and manufacturers showed different motivations and interests. Retailers showed their concern for product safety and brand reputation to reduce risks and secure customer confidence. Exporters and

wholesalers engaged in playing a mediator role, collecting products from a variety of farmers, and distributing them to large retailers.

Lee et al. (2012) found that food manufacturers played a significant role in arranging the supply chains. Lee emphasized the need to inspect the structural framework with small business owners make decisions at the intersection of global and local value chains. Finding a balance between food demand and supply within a sustainable long-term and survival approach for humanity would be one of the toughest challenges in the approaching decades (Boye & Arcand, 2013).

As the population growth increases, the issue of food production and processing becomes a critical aspect of the FB industry. Boye and Arcand (2013) remarked that with population growth emerged other environmental concerns, such as the use of pesticides, environmental pollution, over-fertilization, water shortage due to irrigation, and climate change. The formation of farmers' groups is an innovative advance in livestock farming system modeling. Instead of applying, the model provided by scientists; this method lets farmers redesign processes and construct connecting maps according to reality.

The increased need, to improve agricultural sustainability, required farmers to redesign stock-farming systems (Goutlenoire, Canute, & Ingram, 2013). Goutlenoire et al. (2013) introduced a novel scheme to design livestock farming in a comprehensive manner that includes groups of farmers. The novel process helped farmers identify strengths and weaknesses to create a joint analysis, and allocate, explore, and inquire mapping structures for a self-reflection about the group. The innovative design helped to discover other ways to develop systemic, genetic, and technological innovations.

Land irrigation management and optimization are crucial in arid and semiarid regions. Provenzano (2013) noted that irrigation practices, the use of fertilizers, and the quality of soil are sustainable factors toward nourishing the world population for the next decades. Provenzano highlighted that the increased competition for water resources, low quality of water, and water scarcity placed added pressures on farmers to look for sustainable irrigation methods and techniques. The need for wastewater management increased the search for other alternative options to keep up with the alarming trend.

Water scarcity is a very complex phenomenon linked to the management of other vital needs in society. Provenzano highlighted the importance of providing financial incentives for establishing a sound connection between social, economic, and environmental environments. Therefore, is relevant that adequate policy development includes the appropriate policy formulation.

Sustainable Leadership and Adaptive Management Strategy

The current trend in human resource development (HRD) centered on addressing new challenges for the benefit of stakeholders such as new research in the area of Human Resource Development. Garrity (2012) identified the current challenges faced by HRD to address its complexity, and find efficient solutions. The changes in the technology, workforce, evolving systems, globalization, and flexibility affect the future of HRD.

Adaptive management might be a possible approach to attaining efficiency in water management practices if there are clarity and purpose in the objectives' implementation and monitoring of the program. Some of the conservation initiatives used implementing an adaptive management strategy for different river basin management

such as in the California Bay-Delta and Colorado River Basin, suggested an issue of management fragmentation (National Academy of Science, 2011). The water management situation increased on a large scale where a revision of policies and practices came into question because of the system's management. The concepts of *learning by doing* and *trial and error* were some of the alternatives consider for complex resolution. However, the situation creates an awareness of a change in paradigm from a fragmented scenario to an integrative systems operation.

Some of the public events or challenges could be address if businesses, nonprofit organizations, foundations, higher education institutions, and community groups collaborate with the government. Crosby and Bryson (2010) suggested a theoretical framework to comprehend integrative leadership and the building and continuance of cross-sector collaborations. The study of Crosby and Bryson (2010) made a vital contribution to the understanding of managing in a cross-sector collaborative manner emphasizing the importance of training and education of managers. `

However, a collaborative culture may fail if there is a lack of collaborative leadership and behavior support of the leaders to promote change (Kramer & Crespy, 2011). Wolfgramm, Flynn-Coleman, & Conroy (2015) introduced a unifying framework to analyze intervention in sustainability leadership, the dynamic interactions of agency in leadership (DIAL). Wolfgramm et al. (2015) provided an encompassing framework to understand the breach between the sustainability challenges and the needed skills to face them. The duty of public leaders should confront the challenge to encourage, coordinate,

and maintain other partners' collaboration in problem-solving initiatives, one of the greatest challenges and implications of integrative public administration.

Cross-sector collaboration could help enhance the need for product innovation and help address weaknesses in cross-sector collaboration relationships that affect achieving the goal of sustainability. Metcalf and Benn (2012) commented on the role of leaders and the need to exercise emotional intelligence, a necessary leadership quality for emotional adaptation with those associated with a multifaceted problem-solving situation. Fernandez-Esquinas and Ramos-Vielba (2011) highlighted substantial weaknesses in cross-sector linkages due to the lack of development and collaborative organizations and enhanced firm based innovation. Therefore, cross-sector collaboration is an important element to address the complexity involved in a multifaceted problem-solving situation and to further examined the process of policy evaluation within a contemporary and prospective framework.

An effective collective policy formulation required diverse negotiating behaviors from actors in different sectors and with various forces to achieve success. Some experts in science and policy supported a paradigm shift in water management from a normative and descriptive perspective (Pahl-Wostl, Jeffrey, Isendahl, & Brugnach, 2011). Hence, the modern tendency toward new forms of a dynamic team effort were to achieve group stability and improve previous policy formulation failures.

Technology, globalization, global warming and natural resources management are some of the challenges that leaders need to cope with to stay competitive and succeed in the marketplace. The World Economic (2015) highlighted that is critical to addressing the

emerging global risks of water scarcity and waste management, to be able to minimize their effects in water management practices. The twenty-first century is full of different challenges and complexities that involve leaders to adapt and find methods to sustain their companies in pioneering ways (Petrie, 2014). Metcalf and Benn (2012) examined multiple leadership styles for the practical implementation of corporate social responsibility and sustainability in organizations. Furthermore, Metcalf and Benn (2012) noticed that the real problem within sustainability was the complexity involved in the use of the model. Therefore, organizations as complex adaptive systems needed a leader with extraordinary abilities and qualities.

A society needs leaders who can anticipate and read complexity and engage in dynamic organizational development. By contrast, Erakovich and Anderson (2013) highlighted the need for cross-sector collaboration in achieving organizational change to enhance management potentially and move further than current economic, social and business development competence. Additionally, Erakovich and Anderson emphasized the implementation of management practices, recognizing the values across sectors and increase their effectiveness.

Global leaders' understanding of different paradigms may aid in the building of a holistic approach to a complex phenomenon evaluation. The aim of sustainable development is to permit a paradigm shift in power and corporate governance (Birkin & Polesie, 2011). Bower (2012) recognized that in attaining a sustainable approach to the integration of sustainability within supply chain management, a change in thinking is relevant to handle the systems' complexities. Bower's analysis of the theory of system

thinking highlighted the importance of addressing the use of different paradigms to address the complexity involved in achieving efficiency in water management practices. The factor variation is essential because it provides an array of options and information that may help to provide an overall and assertive assessment of the entire system.

The complexity involved in addressing water management efficiency required different theories and approaches. The individual evaluation and analysis of different models are critical to facilitating the exploration of the dilemma through a practical and predictable performance. The systems' philosophy provides the preliminary reasons and guidance to its exercise and practice. The consecutive publication of complex dynamics and events along with the private view of the different paradigms involve within the systems' theory facilitates the theory analysis and application (World Health Organization, 2012).

Bhalachandran (2012) suggested a model of sustainable growth addressing the value of the integration of the concept of sustainable development into a holistic framework. Bhalachandran (2012) highlighted the existing gap in the lack of integration of the concept of sustainable development into a framework and addressed the contemporary issues and areas of business formation in the global level of thought. The goal of sustainable development may become attainable if there is a collaboration between all members of society for the benefit of humankind. However, certain sectors of the economy required attention in sustainability management, such as government policy and emergency (Starik, Holliday, & Paton, 2012). Starik et al. (2012) emphasized the importance of continually developing policy programs and performance features that can

make the urgency of the cultural and greening ecosystem. However, Badreldin & Goossens' (2013) study emphasized the importance of monitoring mitigation and adaptation strategies and their impact on desertification changes in extreme arid environmental conditions. Desertification is a form of land deterioration caused by an agricultural efficiency loss (Badreldin & Goossens, 2013).

Innovation and the life cycle assessment approach. In the FB industry, it is vital to realize market demands. Some firms in the industry innovate with new ways to increase food security, more sustainable packaging materials, flexible and standard technology, and with the adoption of proven management principles (Mahalik & Nambiar, 2010). Mahalik and Nambiar (2010) examined the food processing and packaging industry to explore recent advances in the field. Mahalik and Nambiar discovered the need for a holistic approach to future research that could identify and help explore the urgency of the analysis and capacity of the entire system instead of one sustainability aspect.

Later on Suprem, Mahalik, and Kim (2013) explored with modern technological applications in agriculture such as robotics, wireless technology, embedded computing, and data management to review their application in agriculture and food. However, the consumable nature of the products seems to be the primary reason that triggered packaging, processing and manufacturing innovation in the food industry (Suarez, Saldo, Rufer, Games, & Roig-Sagues, 2012). Suprem et al. (2013) offered a unique standpoint of modern technological applications in the agricultural and food sectors. There is a need to innovate in the holistic assessment of the capacity and scrutiny of the system.

The concept of innovation relates to two fundamental sustainability aspects of food management and supply in the industry such as food security and conservation. The contribution to food engineering is an advantage in quality, and an increase in security parameters of the products require in the FB industry. Product innovation is a fundamental element in the FB industry to achieve efficiency in the adoption of new water management practices.

Laca, Herrero, and Diaz (2011) commented that LCA is a helpful process to identify pivotal aspects of a process/product service, as well as, to progress environmental impact. Their assessment highlighted the importance of acquiring precise environmental information with the goal of obtaining a functional pointer for decision-making. The relevance of the LCA approach for product innovation with the integration of other appropriate environmental assessment tools could help improve waste management in the industry.

Finally, an increase in consumers' participation in the chain contributed to the acquisition of a higher level of product customization. Wong and Lesmono (2013) highlighted the importance of enhancing product innovation in a vertically segregated market and examined a different aspect of product customization, the amount of customers' involvement along the value chain. Wong and Lesmono (2013) recommended adjusting the model to agree in a pragmatic manner with the production cycle and visualize the model as a multistage system. However, the model's limitation is the inability to address the issue of production flexibility in meeting multiple levels of

customization. The gaining of the consumer perspective is a critical factor for food and production, innovation, and product development analysis.

Food safety and hygiene. The year 2050 presents a challenge for the sustainability of food production in the entire supply chain (Moorthy & Jeyabalan, 2012). Moorthy and Jeyabalan (2012) addressed the duality of global food security and water management. These two themes are relevant to the sustainability of billions of peoples and businesses in the coming years.

The food system is complex in its development, determinants, and the impact on farms and is of vital importance consolidating food processing. Reardon and Timmer (2012) conducted an empirical study to analyze the development of the food supply chain and to examine the economics of the system-wide changes. The existing literature on food systems is strongly on distribution research along the food supply chain; however, limited in its social foundation, behavior, and performance (Reardon et al., 2012). Reardon et al. (2012) identified a gap in government data about food supply chains in developed and in developing countries. There is sparse information about food value chains and the effect on poverty and the environment. The lack of a firm theoretical framework limited scientists' abilities to obtain the necessary information to conduct empirical research and test its validity.

Ram, Corkindale, and Wu (2013) developed a conceptual model to establish a relationship between certain critical success factors (CSFs) and enterprise resource planning system. Their findings demonstrated that some CSFs such as the company business plan, vision, and cultural changes were not vital for the successful

implementation of ERP, but to improve organizational performance. Likewise, Blasini and Leist (2013) suggested that the prior research has paid little attention to process performance management about improving business performance. Blasini and Leist's multiple-case study and multimethod research approach identified relevant success factors from a previous frequent occurrence in the literature review and living experience from experts.

Organizational learning aid leaders develop the requisite components to drive organizational performance. By contrast, Zangiski, Pinheiro de Lima, and Gouvea Da Costa (2013) developed a conceptual framework to address the role of organizational learning. Knowledge management (KM) is critical for global companies. The upshot of that gathering of knowledge is organizational learning, particularly in the operations management context. Consequently, the collection process is a factor that depends upon the building organizational competence and to manage the business resources.

Human over-production and excessive consumption patterns create additional strain to the problem of water scarcity (Ridoutt & Pfister, 2013). Ridoutt et al. (2013) developed a significant innovation in life cycle assessment (LCA) including the development of portfolio guidelines and new impact evaluation methods in water use. However, there is still a gap to achieve the integration.

Life cycle assessment (LCA) will help overcome the knowledge obstacles that hamper the acceleration of environmental benefits at a planetary scale. Life cycle assessment (LCA) could become a relevant factor for future research if companies want to take advantage of their environmental challenges. Kenthorai and Penn (2013)

emphasized the use of Life Cycle Assessment for addressing future research in environmental assessment with a more holistic framework. Therefore, LCA theory provided a valuable framework for the sustainable implementation of biological processes that aided to act upon the realization of socially responsible production in the FB industry. However, there is a lack of awareness of technologies that address the intensive treatment of water, and a cost-effective plan for water recovery and reuse.

Unethical business practices could decrease consumer loyalty and confidence. Leonid, Kvasova, Leonid, and Chari (2013) surveyed 387 consumers' perceptions of unethical business practices, and their influence on trust, satisfaction, and loyalty. Leonid et al. (2013) discovered that high levels of unethical behavior decrease consumer confidence and negatively affect customer loyalty.

Kubota and Da Rossa (2013) commented upon the demand for cleaner industrial operations as a viable option to address problem-solving issues for milk producers in Rio Grande, Brazil. Kubota and Da Rossa (2013) used the theory of inventive problem solving to address cleaner production issues and to improve environmental efficiency in food production. The theory of inventive problem is solving helped to identify the critical processes in the industries. Additionally, the method is a practical alternative to address issues of cleaner production.

Likewise, internal and customer integration strongly relates to improving performance rather than supplier integration. Betta, Barbanti, and Massini (2011) revealed that the poor hygiene of equipment is an important issue in the FB industry. Betta et al. (2011) examined Aseptic Processing and Packaging Systems to recommend

the implementation of laws and documents that address food safety. Food regulations in the industry are required to control outbreaks of food-borne disease, which, in turn, influences the implementation of public health policy.

The European legislation is very clear concerning its requirements concerning the handling, preparation, processing, and packaging of food that needs to be hygienic in alignment with the adequate machinery and foundations. There is also specific equipment compliance requirements, along with other necessary food and security requirements. The majority of the encroachments of the law in the industry are because of the lack of sanitation and drainage of the equipment in pumps, valves, mechanical, seals.

Lawful requirements in the FB are central to stay competitive and should be the basis for improving hygiene and safeguard the safety of consumers. For example, the need to design, engineer, and install food equipment that complies with food regulations and stipulation, policies, and guidelines are a regulatory requirement in the industry. Safety is another pivotal factor in the FB that requires further attention.

The increased trend toward more sufficient nutritious and healthy food amplifies, even more, the need for sustainable food production and processing. Companies in the FB industry should grow food with a less environmental footprint to achieve the goal of long-term sustainability of humanity and the ecosystem. Carmody, Weintraub, and Wrangham (2011) highlighted weaknesses in the F & B industry related to existing food-labeling practices and identified a strong preference for processed diets. Water management also involves dealing with proven substantial and pragmatic implications for designing the most appropriate diets.

Changes in land and water management. Humanity's struggle for the sustainability of life, emphasizes the importance of water, because humans may spend days without food to survive, but not without water. Otero, Kallis, Aguilar, and Ruiz (2011) examined the history of land and water transformations in Matadepera in Barcelona, Spain. The empirical study was an extensive review of Grey's historical literature that created an awareness of the efficient formulation of policies that served to promote social justice concerning essential natural resource management. Water scarcity is a natural condition; however; every citizen plays a role in wise water consumption for the mutual benefit and the development of environmental and economic sustainability. Hence, the possible solution to a sustainable use of water is to make a reflection of what happens when there are no consumption guidelines, policies, and other necessary measures to regulate the use of water. Otero et al. (2011) questioned the acumen of the modern water policy disputes, and what visions will prevail to ensure environmental justice.

The landforms' impact of human activities also affects water availability and distribution. Abel-Magd and Herms (2010) studied a multitemporal/satellite imaginary of the Nile Delta in Egypt, and their findings showed consistent changes in the landform of this area. The effect of human behavior in this area had altered the landforms and added new lands. The new technique of remote sensing is a useful tool to help in the identification of 11 types of landforms that formed a dynamic environment in the Nile Delta in Egypt. Land and fish landforms are changed by 37% and 11% increase respectively.

Likewise, livestock also has an adverse outcome on land, water, biodiversity, and climate change (FAO, 2013). According to the opinion of some experts, the right policy formulation may provide opportunities for millions of people that depend on it. To achieve the goal of sustainability in water resource management, global leaders should monitor land use and its changes (Elhag & Psilovikos, 2013). Elhag and Psilovikos (2013) concluded that the rapid and unbalanced changes produced by soil degradation and land fragmentation processes over agricultural land produced by the civil infringement; affect the sustainability of water management.

The emphasized need, to observe long-term changes in residue ecosystems in previous literature, is essential to identify other opportunities and benefits from the analysis of the historical data (Guerin & Lowe, 2013). Those lands pose the threat of fragmentation and climate change. The detected differences in community structures over time by monitoring vegetation helped discover principal concerns about costs and benefits.

Cook and Yamamoto (2011) presented an alternative strategic model that compared the classical approach of firms to strategy versus the effectuation theory. The pioneer's view of the strategy showed how effectuation and the expert entrepreneur mode of thinking have roots in military history. The assumption that global leaders can always control their environment and resources is not always assertive. Therefore, risk management is critical to attaining the goal of resource efficiency.

Nevertheless, unmapped territories are the ones under this new way of thinking because those require expert information and the appropriate resources to identify risks in

a turbulent, dynamic, and changing environment. The main difference between the model of effectuation and the classical strategic approach is in its practical application because of the lack of a preestablished plan of operation in the classical strategic approach (Behdani, Adhitya, Kukszo, & Srinivasan, 2012). Therefore, in turbulent and unpredictable market environments, it is vital to identify when to use both methods for a particular time, such as in a case of infestation in turbulent and unpredictable market conditions.

Technology. Technology constituted an essential part of the function of detecting landform changes affecting the sustainability of the ecosystem. One pivotal factor affecting the sustainability of many businesses is human behavior. A collaborative approach may noteworthy alter apparently the unhealthy flow toward a better sustainable and natural flow of human development and the environment. Reverse osmosis is a broadly used technology to treat the quality of water. However, the use of this method to purify water is prone to fowl contamination, which diminish the process reliability (Vercelino, Morse, Tran, Hamood, & Red, 2013). Vercelino et al. (2013) underlined the importance of sanitation in potable water within water resource management.

Some companies adopt newer technologies to comply with regulation and to protect their business reputation. Hermine and Sidhu (2011) emphasized the importance of waste management, a key driver in water efficiency. Fuel efficiency is also linked to efficient water management, not in its liquid form, but the evaporation state form. There has been an emerging interest in resource scarcity management (Smit, Scheijgrond, & Severin, 2012). Smith et al. (2012) improved resource management by reducing

unnecessary impacts on the economy and the environment, to find an efficient balance between production, consumption, and demand. Smith et al. (2012) identified two important aspects of resource management, the issue of resource shortage, and the issue of setting a limit to its use and expenditure.

Garrity (2012) conducted a review of the critical topics involved in Hardin's tragedy of the commons and concluded that Hardin's model might offer notable insight to the solution of global issues. The new sustainable view of business that supports growth is directing the economy toward a misleading evolutionary path. Garrity promoted a paradigm shift to make people aware of the importance of adopting a collective mental model to address the dilemma of resource over-consumption and exploitation. However, a key phase of mitigating extreme soil exploitation or desertification is to increase water management efficiency (Lal, 2015). Lal (2015) study make global supply chain leaders aware of the need for a restorative strategy is critical to addressing futures water risks and mitigate other threats related to food production.

Water costs and taxes are two decisive factors that contributed to the implementation of water recycling systems and wastewater treatment. The waste control and the sanitary tax are regulations in the industry (Schittone, 2011). Schittone (2011) concluded that strict environmental regulations would foster the development of novel technologies for the development of wastewater treatment. Policy control formulation will help achieve the critical goal of environmentally friendly wastewater discharge and recycling.

Schittone (2011) examined the issue of water management from a different perspective and discipline known as distributive justice to bring the paramount importance of many humanitarian stakeholders; water is a major life-affirm or life-depriving natural resource. Schittone emphasized the importance of life and further economic growth in the sustainability of water management. Schittone explored the concepts of sociology and demography along with other relevant economic and legal considerations involved in water resource management.

Joyce, Mehta, Purkey, Dale, and Hanemann (2011) applied the water evaluation and planning system to assess the water supplies and demands. The model helped with the assessment of the impact of changing agricultural management strategies in response to climate change. The assessment will help to develop improvements in irrigation technology and harvesting patterns toward higher valued ones. Therefore, the achievement of sustainable water standards in the industry depends upon the elaboration of more inflexible environmental controls. The absences of strict water measures have a negative impact on the sustainability of water management practices in the FB industry.

Gerbens-Leemes, Van Lienden, Hoekstra, and Van Der Meer (2012) provided an assessment of the global water use linked to biofuel use for road transport in 2030. The purpose of Gerbens-Leemes et al.'s (2012) assessment was to calculate the potential contribution to water management efficiency. The combined data of the water footprint analysis for 2030 considered first-generation biofuel bioethanol from sugar cane, sugar beet, wheat, Indian corn, and biodiesel from soybean, rapeseed, and oil palm. Gerbens-Leemes et al. (2012) concluded that the global biofuel usage will increase more than 30%

from 2005-2030. The United States, China, and Brazil contributed to half of the global biofuel, water footprint.

By the year 2030, Gerbens-Leemes et al. (2012) anticipated a possible increase in the global biofuel water footprint of 5.5% of the total available blue water for humans. Gerbens-Leemes et al. created an awareness of the future pressure on fresh water consumption. The dispersion of products is a fundamental form of supply chain management that might depend on the sustainability of water. Thus, producing biomass for biofuels could negatively affect the sustainability of the economy, society, and the ecosystem.

Because water scarcity comes from different sectors, it is essential to address the multiple feedback loops and submodels (Susnik, Vamvakeridou-Lyroudia, Savic, & Kapelan, 2012). Susnik et al. (2012) offered a new model for the assessment of water scarcity to examine the impact of socioeconomic policies in a multifaceted hydrological system. Susnik et al. provided an assessment of the water shortage in the geographic area of Kairouan, Egypt and helped researchers analyze current and future performance for the understanding of trends and future policy development. Susnik et al. indicated an over-exploitation that could produce future, serious implications for the economy and the environment. Sputnik's model facilitated the formulation of more pragmatic parameters in the domestic sector modeling consumer behavior, providing a critical assessment of water scarcity in key areas, and a deeper understanding of local and global water scarcity.

Transition

The purpose of this qualitative, multiple-case study was to capture the multifaceted strategies, leadership approaches, and water management practices of global leaders and water experts in the FB industry. The participants consisted of two global supply chain leaders in the FB industry and one water expert in northeast Georgia. The findings of this multiple-case study may assist global supply chain leaders, sustainability leaders, policy makers, and entrepreneurs to make informed decisions, and increase an understanding of water management efficiency in the FB industry.

Moreover, I used open-ended face-to-face interviews to collect the data and to conduct a case study design. I intended to gather the actual experiences and actions from global supply chain leaders and water experts to offer a holistic approach to the phenomenon of water management efficiency. The multiple-case study may assist other global supply chain managers in the industry to gain a deeper understanding of their business models and sustainability perspectives concerning their water and supply chain management initiatives.

After an examination of the literature and offering the background and purpose of the study and its implications, I provided an overview of the multiple-case study in the next section. In Section 2, I discuss the project and its purpose with a focus on the strategic approach and organizational behavior from the different perspective of policymakers, corporate leaders, and consumers. Section 3 consists of the doctoral research findings of the leadership actions of global supply chain leaders in the FB

industry, to gain an insight of their business models and views of their water sustainability practices.

Section 2: The Project

The purpose of this qualitative, multiple-case study was to address the concern of water management efficiency in the U.S. food and beverage (FB) industry within a holistic approach to supply chain management. The multiple case study approach was used to discover the leadership factors and strategic activities of global supply chain leaders and water experts about water management efficiency within an advanced approach to supply chain management relationships.

Purpose Statement

The purpose of this qualitative multiple-case study was to discover successful water strategies used by global supply chain leaders and water experts in the U.S. state of Georgia to address water management efficiency. The study population consisted of two global supply chain leaders from two multinationals and one water experts in the public water utility system in northeast Georgia who managed their businesses in water shortage-prone areas. The study was designed to generate findings that would help other global supply chain leaders gain a deeper understanding of issues related to water management efficiency, food production, and waste management. The study was also designed to generate an improved awareness of the importance of adapting their business models and sustainability views to facilitate the decision-making process in attaining water efficiency and addressing resource sustainability uncertainty.

As a leader and citizen, I expect to help the community by exploring efficient water management practices and the critical role of business in society. Water conservation is necessary to achieve efficiency in resource management (UNESCO,

2012). Michelini and Fiorentino (2011) provided a method for the equitable distribution of potable water and water waste prevention in the community. From a social change perspective, it is essential to understand the emerging water-related issues that may affect freshwater sustainability for future generations because emerging population and climatic trends could affect the water availability of future generations.

Role of the Researcher

I collected data by conducting 10 face-to-face interviews to global supply chain leaders and water experts among three global companies in the FB. I explored, compared, and discerned the best strategic approaches to address water efficiency concerns in the FB industry among two multinational companies. I aimed for identifying effective water management practices in the FB industry and create an awareness of the importance of achieving future resource sustainability. The National Commission for the Protection of Human Subjects of Biomedical Research Subjects provided ethical guiding principles for the protection of humans in the Belmont Report of 1979. The three main beliefs expressed in the Belmont Report are (a) the value of respect for people, (b) beneficence, and (c) fairness. I applied these ethical guidelines involving the treatment of individuals in the multiple-case study by designing, interviewing, transcribing, exploring, validating, and reporting with integrity, respect, and proper data documentation, in accordance with Marshall and Rossman (2015).

Some global companies in the FB industry provide excellent resources on their company websites for researchers and students about their water management practices and sustainability initiatives, such as many public limited companies (PLC). Among

these PLC's are (DIAGEO, 2015; Miller Coors, 2015). After obtaining Institutional Review Board (IRB) approval # (09-22-15-0368709 and expiration date September 11, 2016), I used purposive sampling, but was also open to snowball sampling as a secondary choice to select recommended global supply leaders in the industry or water experts affecting water use on a global scale.

The value of water is a complicated business, economic, and social risk related to water efficiency because of different shared locations and global exposure to water stress (EPA, 2013). EPA (2013) highlighted the absence of consistent data to justify the use, quantity, and quality of water and therefore, this fact increases the significance of water within the agricultural, public water supply, production, and manufacturing sectors of the economy. Water is an essential resource for the central production of goods, water supply, and food production; in the United States, food production accounts for 94% of the water drawn from rivers, lakes, streams, and groundwater (EPA, 2013). Global supply chain leaders may benefit from a case study approach and understanding of water management practices by learning to cope and identify potential risks along the supply chain in attaining water resource efficiency.

The subject of water scarcity in water management practices is a growing concern in the FB industry because water conservation is a critical factor at addressing resource efficiency. However, the quality of water is a topic that as a consumer and a scholar raised concern and interest. From a consumer perspective, water also links to food security and production, a fundamental reason to conduct research on this topic in the FB industry. However, in analyzing the relation of water as a system, and its related systems,

the increased overproduction and overconsumption of processed food did not fulfill either the role of qualitative nourishment or water conservation practices in society. The appearance of life-threatening diseases such as obesity, heart blood pressure, diabetes, and food allergies had increasingly become a global and personal health concern. Furthermore, the dilemma of increased growth in population and overconsumption create additional stress in the demand for food and, therefore, an increase in the interest for waste management.

From a business perspective, water waste and poor risk management are a threat to water quality. Therefore, to attain water efficiency is pivotal to increase consumers' awareness of the relevance of water efficiency and conservation in society. I resided for almost 8 years in Georgia, a semiarid and water-distressed area where citizens shared Lake Lanier with Florida and Alabama residents for their water supply needs. Water quality is an increasing concern in many states (NRDC, 2013). Furthermore, water precipitation in Georgia during certain seasons is irregular, and severe droughts occurred in the past (WEP2, 2015).

I selected a purposive sampling technique to help explore a contemporary social, business, and economic phenomenon by capturing the actual leadership activities related to water efficiency from recommended expertise by participants at different knowledge levels. This technique helped access reliable expertise and experience about water efficiency, and facilitated the access to the actual leading experiences of global leaders in water management efficiency. To avoid any bias, I verified the data collected from the participants' interviews for integrity, consistency, and to eliminate discrepancies. This

practice helped to ensure the credibility of the information provided by the participants in the multiple-case study, since I had to assure its reliability and validity by reviewing and reaching data saturation until no new themes or concepts result from the data interpretation and analysis.

I conducted this interview protocol in order to access expert information for the selected population through a case study by asking how and why questions to deepen the understanding of the phenomenon. I also collected other public and available information from multiple data sources: (a) company reports of multinationals and PLC companies in the FB industry; (b) nongovernmental organizations reports on water efficiency; (c) government reports policies and strategies; and (d) symposiums, seminar, and webcast series. This diversity of sources was intended to provide an insight of the contemporary phenomenon under study and contribute to a solid understanding, as recommended by (Farquhar, 2012).

Participants

I used a purposive sampling technique to gather suitable participants for interviews. The eligibility criteria for the participants in the study were: relevant skills and expertise related to the topic; position occupied in the group; educational background; and strategic experience in water management and global supply chain management. Participants could be of any gender. The selected participants for the multiple-case study were global supply chain leaders or water experts in the FB industry with experience understanding or knowledge of water management and an established plan to address efficiency in a multinational company in Georgia. I accessed key

participants for the multiple-case study using a purposive sampling technique. The participants consisted two global supply chain leaders and one water expert in Georgia. I sent a formal written email letter (Appendix C) to explain the purpose of the multiple-case study and to comply with the ethical procedures involve in ensuring participant privacy and confidentiality.

I continued interviewing participants until no novel information emerged, indicating data saturation, as recommended by Baltar and Brunet (2012). The selection of participants focused knowledge expertise in the field of resource management and supply chain development, and the decisive position occupied in each multinational. I used LinkedIn, a professional social website, to seek out other participants, assess their expertise, and help meet the trustworthiness of the data required in qualitative studies, in alignment with Streeton and Cooke (2004).

Research Method and Design

The purpose of this qualitative multiple-case study was to explore the concerns for water management efficiency in the FB industry by providing a holistic leadership approach with multiple sources. I explored the contemporary phenomenon of water management efficiency, from various standpoints using multiple sources of data such as preexisting company reports, government and nongovernment reports, forums, water stewardship reports, symposiums, and online industry seminars. The secondary resources helped identify relevant themes and patterns related to the central research question, and to the issue presented in the multiple-case study. Participants such as global leaders or water experts in the FB industry with expertise knowledge among different leadership

backgrounds may help establish the validity of a needed shift approach to policy-making (Rietig, 2014).

A collaborative management approach was a valuable framework to address a complex phenomenon like water management efficiency. Consequently, in dealing with the issue of water management efficiency, it is vital to pay attention to the interrelationships that define social interaction, an essential component in case-study research (Schaefer, 2011). Therefore, a collaborative framework for discussion and analysis helped increase the trustworthiness and validity of the study. A qualitative multiple-case study was an appropriate method and design to explore different classes and concepts in addressing the growing concern for water management efficiency in the FB industry. Moreover, the use of company reports and open-ended questions helped with the collection of the information needed to fulfill the purpose of the study.

Research Method

I used a qualitative method to explore the issue of water management efficiency in the FB industry. A qualitative study helped provide a comprehensive understanding of the essence of water management efficiency and its relevance to achieving future long-term water supply sustainability. A qualitative method with expert knowledge and understanding created an awareness of the topic importance and the value of collaboration in water management practices.

Likewise, a qualitative method offered the opportunity to gather collaborative knowledge to understand and improve water management by adapting to change. According to Preskill and Jones (2009), strategic evaluation is critical to promote social

change concerning water resource management and catalytic philanthropy. Catalytic philanthropy is a novel approach useful to achieve transformational change with a collaborative effort and a collective collision to impact social issues affecting society (Preskill et al., 2009).

In studying the best way to address the concern for water management efficiency, I collected the data by conducting interviews using a qualitative method. Qualitative methods explore a dilemma by getting to know the actual leadership activities of participants on a particular issue (Qu & Dumay, 2011). By contrast, a quantitative method examines an issue from the formulation of a hypothesis or by conducting surveys; therefore, this method will not suffice to address the multiple-case study design (Simon, 2011). The research question was also in alignment with a qualitative approach in comparison to a quantitative or mixed methodology. The multiple-case study focus was to explore and discover the best strategic approaches to achieving water management efficiency, not to examine water efficiency through detailed statistical analysis (Denzin, 2009).

A qualitative method was the best choice to explore and explained the growing interest from the leadership activities of various participants, and with a multisource approach for impartiality. Multiple approaches linked different types of knowledge needed to address the issue of water management efficiency in a collaborative manner (Plumer, De Grosbois, Armitage, & De Leo, 2013). Furthermore, the relevance of providing a deeper understanding of the phenomenon of water management efficiency by gathering documentation, through methodological triangulation, different viewpoints and

leadership backgrounds, provided the foundation to discover the most effective strategic approaches in the FB industry (Yin, 2009).

Research Design

I used a multiple-case study design to address water efficiency in the FB industry. This plan was appropriate to explore the complexity of a contemporary phenomenon because I provided the audience with multiple viewpoints allowing the exploration of the topic within a comprehensive assessment (Baškarada, 2014). Furthermore, a case study design was appropriate because of the value of communicating and sharing with different knowledge for the improvement of water management practices in a particular industry (Yin, 2011).

A case study design was appropriate to detect ambiguities in a nonlaboratory setting and helped address the research question, as well as, described a contemporary dilemma rather than a historical one (Yin, 2009). Knowledge was a crucial factor in the description and exploration of a particular situation with a collection of sources and actual experiences. By contrast, a phenomenological design was not as accurate and recent as a case study because a phenomenology focuses on the lived experiences of individuals (Moustakas, 1994). By contrast, a qualitative method with a case study design was appropriate for addressing water management efficiency with supportive evidence, as the primary foundation of knowledge, with the actual experiences of a particular issue, industry or company. Therefore, achieving an understanding of the key factors that impact striving for water resource efficiency.

Therefore, it was essential to explore the various leadership activities concerning water management efficiency to provide a comprehensive study of perceived reality (Le Compte, 2000). The exploration of actual experiences of participants provided an enhanced structure to focus on the concern of water management efficiency in the FB industry (Van Manen, 1990). By contrast, an ethnography design focuses on the methodical study of a particular culture, group, or a company (Le Compte, 2000). Consequently, an ethnography design did not provide an answer to the research question. However, impacting human behavior and social learning were critical factors in achieving the goal of water conservation and management. Future ethnographic research that focuses on learning about the culture will aid to target particular resource management concerns in understanding the multiple purposes involve in human actions and people's views to develop innovative models and theories.

Population and Sampling

The multiple-case study population consisted of two global supply chain leaders from two multinational companies in Georgia and one water expert in the public water utility system. The criteria for selecting participants was a master's degree or topic expertise in supply chain management, environmental science or system engineering; technology, metrics, and resource sustainability knowledge; water management expertise; and leadership position occupied by the group. The face-to-face interviews included global supply chain leaders or water experts such as chief executive officers, sustainability directors, applied scientists, resource management directors, and industry experts.

The justification for the number of participants for this multiple-case study is in alignment with a qualitative approach for multiple-case study designs balanced with a depth of inquiry previously addressed. A cross-case synthesis among three cases was enough to strengthen the findings even further, as each case study findings was treated individually with a demonstrated process of the efficacy of the strategy, as suggested by Yin (2012). A qualitative multiple-case study design is suitable to focus on a particular and contemporary phenomenon by conducting a minimum of 10 interviews or more until no new data emerges, indicating data saturation.

However, the sample size to achieve the multiple-case study consisted of two global supply chain leaders' interviews from two global companies and a water expert from the public water utility system. The sampling method used was a purposeful sample (Diamond, Fiester, DiSalvo, Pelc, & Bruckman, 2012). The fewer the participants used in the study, the deeper the inquiry per individual (Darke, Shanks, & Broadbent, 1998). The number of the participants in the multiple-case study facilitated the depth of inquiry and the quality of the information resulting from the analysis of multiple-cases, with a proven method of the effectiveness of the strategy in the resulting study findings (Flyvbjerg, 2006).

The purposive sampling, focused on a particular population of participants that were of interest to the researcher for achieving the study purpose (Stewart & Stasser, 1995). Saumure and Given (2008) commented that a purposive sample or probability sample helps set aside the researcher's judgments in selecting the participants in the study; for example, water experts in the FB industry. In this particular case study, the

purposive sampling is expert sampling that focuses on expertise with a small sample to provide a descriptive, deeper picture of the focus of the study and knowledge of individuals with a particular expertise (Baker & Edwards, 2012).

Likewise, Luyet, Schlaepfer, Parlange, and Buttler (2012) commented that an appropriate strategy for improving natural resources management is participation. However, stakeholder identification and evaluation are critical to ascertain who should participate. Another possible option was the snowball technique that provides diverse and reliable access to participants with known expertise among colleagues who know each other's capabilities (Luyet et al., 2012). Furthermore, I also considered using networking sites such as LinkedIn as a medium for accessing potential participants.

Ethical Research

I took several steps to ensure that this study complied with general and institutional ethical protection standards and requirements. Bloomberg and Volpe (2008) emphasized the importance of delivering value in research content and inquiry to provide a critical synthesis of the information presented. I also followed Newman's (2011) three vital principles for conducting ethical research: (a) treating participants with respect, (b) letting participants know in advance about the study requirements by obtaining their approval before conducting the study, and (c) protecting the participants' confidentiality. The process of data collection began by distributing by e-mail the ethical consent form to the participants (see Appendix D). The participants received the ethical consenting process form by email and voluntarily agreed to participate and signed the completed form before beginning the process of face-to-face interview. The Walden University's

IRB approval number for the study is 09-22-15-0368709 and the expiration date is September 11, 2016.

The participants' interview contributions were voluntary, and they had the right to withdraw from participation in the multiple-case study, in the same manner, they decided to participate. I did not provide incentives for the participants in the multiple-case study. I kept the transcribed interview data in a safe container with a combination lock, to honor the right of privacy of the participants and assigned different pseudonyms to protect the participants' identity. Furthermore, participants had the opportunity to validate their answers to ensure data accuracy and validity.

I used the Atlas.ti7 software from QSR International to gain a holistic insight of the information. This practice helped form an interrelationship among the participants collected data with open-ended question coding and themes. Moreover, during the first data analysis process, the program facilitated the visual process of coding and categorizing in a continuing process until confirmed with all possible categories.

I kept the physical data secure in a locked safe at home with a password protection. If questions arise, I will maintain the information for 5 years after completion of the doctoral study. After that period, all physical and interview saved data will be erased and destroyed. I am the only person with access to the password, and any physical, supplemental written data will be shredded and destroyed after the retaining requirement of 5 years, and after the completion of the doctoral study.

Data Collection Instruments

The data collection process included three personal communications with semistructured, flexible, interview questions to conduct the interviews (Appendix A) as the primary source of collecting the data. I conducted a respondent validation by reviewing and verifying with each participant the transcribed interview information to certify the reliability and validity of the interviews. Then, I compared the secondary data such as internal reports, preexisting company reports, symposiums, conferences documents, and webinars on global water management, government reports, nongovernment organizations, and sustainability surveys with the resulting themes and patterns from the transcribed analyzed material and coding for multiple data source and theory triangulation.

I recorded the interview data on the computer with a password-protected individual file as a second backup for verifying alignment with the views of the participants, and individually assigned pseudonyms to assure the participants' privacy. Then, I transmitted the data to Atlas.ti7 software for further analysis, and identified possible concepts and linkages that helped obtain a deeper understanding of the dilemma of water management efficiency. The Atlas.ti7 software was a useful application used for data analysis in qualitative inquiry that facilitated the process of visualizing the data more effectively. I used the Atlas.ti7 software to assist in the presentation and interpretation of the data in a logical manner and to help maintain alignment with the research questions underlying the conceptual framework of the multiple-case study.

Data Collection Technique

I collected the data by conducting two semistructured face-to-face interviews to global supply chain leaders and one water experts in the public water utility system in northeast Georgia with open-ended questions. Likewise, I combined the data collection technique with other documentation, such as preexisting company reports, nongovernment, and government organizational reports, global industrial forums and reports, conferences, symposiums and any other documentation suitable for a case study research analysis and evidence support (Yin, 2009). The methodological triangulation analysis prevented the occurrence of bias and misinterpretation that might question data validity relating to the case study exploration. Therefore, a case study approach helps to explore a contemporary phenomenon with multiple sources for data consistency and reliability (Yin, 2009).

The interview instrument consisted of semistructured, open-ended questions, which align with how and why questions of the depth of inquiry in a case study design. Although interviews could result in the disadvantage of misinterpretation from the researcher's viewpoint, I confirmed the trustworthiness of the transcribed information from the participants' interviews to ensure the accuracy of their responses.

As a researcher, I do not have any relationship with the topic water management efficiency, but the FB industry is a water-resource dependent industry. I had the previous academic opportunity to research the FB industry and take active participation in the functional food and wellness market as a consumer, and as a sales representative. The changes in consumer preferences in the FB industry, originated parallel to the emergence

of a global awareness related to life-threatening diseases such as obesity, heart, blood pressure, diabetes, and food allergies; and those diseases also became a growing concern in the FB industry (Betoret, Betoret, Vidal, & Fito, 2011). I gained knowledge about the industry while working in the functional food market and by attending Aseptic Technology, an online event sponsored by Beverage Daily.com and Food Production daily.com, United States.

Data Organization Technique

After comparing the interview notes with the transcribed data, I started with the process of data organization. The data organization process consisted of the following steps: (a) data checking, (b) keeping and reviewing a reflective journal throughout the study, (c) entering raw data into a qualitative data analysis software, such as Atlas.ti7, and (d) revising researcher notes (Yin, 2011). During the data organization process, I also used Microsoft Word and Excel to recognize themes, patterns, trends, and prevailing topics, that occurred, as well as, to differentiate conflicting participants' explanations, different viewpoints, and reviews (Yin, 2011).

I saved the recorded interviews on the computer with a specified password. I will be the only person with access to the password and the participants recorded interview information. I translated the information into Atlas.ti7 software for the process of analysis and codification. For classifying the use of the secondary data, I used a color-coding to facilitate its management analysis, and link relevant data with emerging themes. Furthermore, kept track of the data, by securing all emerging analysis, such as research logs, reflective journals, and cataloging systems in a safe box with a safety lock for a

period of 5 years after completion of the doctoral study. After that period, I will then destroy by shredding all physical document material and erasure of all electronic files to protect the confidentiality of the participants.

Data Analysis

I explored a contemporary phenomenon by using how and why interview questions and analyzing the data in a consistent and coherent manner with the appropriate procedure associated with a multiple-case study design. The use of how and why questions together with multiple sources of evidence such as the review of preexisting company reports, reliable government reports, conference material, and symposiums, was suitable for conducting a cross case-study research analysis (Yin, 2009).

Moreover, I used inductive reasoning with the Atlas.ti7 software to generate different classification categories and explore the linkages between the various key concepts identify in the data analysis. The Atlas.ti7 software is a program used in qualitative research and suitable for interview recording and analysis. I used the Atlas.ti7 software as a tool to help organize the transcribed data with the generation of various classifications and to facilitate the analysis and interpretation in a consistent manner.

According to Newman (2011), a method to analyze data could affect the preliminary level of analysis followed by a deeper review that calls for identifying groups of data on various topics for greater inquiry. I kept a logic sense of the evidence by exploring different sources of information with a cross-case synthesis among three individual cases to reinforce the findings even further (Yin, 2009). However, Yearworth and White (2013) illustrated the casual loop diagram (CLD) as another method for further

analysis and interpretation during the coding process. During the coding process, I divided the data into themes and conducted a detailed approach by using the method of the casual loop diagram (CLD). This reliable method brought forward the process of qualitative data analysis with a meticulous approach to systems dynamic modeling. Then, I recognized patterns and reviewed their relationship between diverse fields, to reveal complex data analysis and presented accurate interpretations until no other novel information emerges in the inquiry (Yin, 2014).

The theory of subsystems outlined a map of the reality and complexity involved in water management that links resourcefulness with actions to find the best way to address water efficiency in the FB industry (Covington, 1998). Likewise, Gregory (2007) portrayed the systems theory as a logical approach to strategic planning by the implementation of an organized plan for the allocation of the organization resources. Cilliers et al. (2013) combined case studies to illustrate the complexity of social issues in natural resource management that proved the validity of complexity thinking in managing multiple systems. Therefore, I established the need to use multiple concepts to attain the system's understanding and efficiency.

In addressing the concern of water management efficiency, there are many unpredictable variables that comprise the issue. Through two interviews with global supply chain leaders, and one interview to a water expert in the public water system, I reflected upon the way in which different activities and experiences make learning possible, within a holistic understanding of water management efficiency. Change is inevitable and is relevant, to provide a way to address the complexity and uncertainty

associated with the functions to adapt and assess the whole organization and its subsystems (Intergovernmental Panel on Climate Change (IPCC), 2012). Furthermore, global leaders' actions should create the social awareness of the relevance of water management efficiency and influence their businesses, the economy, and society with effective water management decisions and policies.

The Google Scholar email alerts and new reports from the National Academies Press (NAP) aided to recognize new studies published in water management efficiency, since the writing of the multiple-case study and before the publication of the doctoral study. Likewise, the key concepts recognized in the literature review section of the study were the main focus for further analysis and to identify other related ideas resulting from the data transcribed from the participants' interviews. The conceptual framework selected for the study served as a roadmap of the main themes relevant in the study analysis.

By collecting the actual leadership practices of other global supply chain leaders sustainability reports, I explored the social dimension of the issue and provided an understanding of the relationship, between the different subsystems in their supply chain management to attain the goal of sustainable development. For that purpose, a multiple-case study with open-ended questions, semistructured interviews, and secondary data allowed optimum data collection (Yin, 2009). The use of multiple documentation also to the transcribed data from the face-to-face interviews aided in achieving methodological triangulation and validated the data among different informational sources.

Reliability and Validity

Reliability

The aim of this qualitative multiple-case study was to explore the actual experiences and strategic management approaches of global supply chain leaders and water experts in the FB industry. The study involved conducting three semistructured interviews with open-ended questions to two global leaders in the FB industry of two multinationals and one water expert in the public water utility system in Northeast Georgia. The participants' selection of two global supply chain leaders and one water experts, such as chief executive officers, sustainability directors, scientist, engineers, and water experts of three multinationals in Georgia helped deliver external validity or transferability along with all the descriptive data used in the study (Yin, 2009).

The face-to-face interviews and site observations helped gain a deeper understanding of their business models and water sustainability views, to build a better understanding of their water management initiatives for actionable knowledge that could contribute to achieving social change. The respondent validation of the transcribed material supported to achieve internal validity, along with the use of various data sources and multiple theories (Yin, 2009). Furthermore, I added credibility by verifying the transcribed data from the participants. I confirmed and verified the participants' responses with the information collected and their feedback to reduce bias and misinterpretations.

Validity

During the first data analysis progression, I identified and categorized themes by using Atlas.ti7 coding and used multiple data sources for data analysis and methodological triangulation. I combined the data collection with other existing company, nongovernment, and government organizational reports, and other documentation suitable for a case study research analysis (Yin, 2009). The methodological triangulation analysis prevented the occurrence of bias and misinterpretation that might question data validity about the case study exploration of water management efficiency in the FB industry. For evidence support, I employed different data collection sources such as semistructured interviews, industry case studies, company and government organizations' reports, global organizations and industrial forums, industrial networks, and reports.

I used casual loop diagram, coding for system analysis (Onwuegbuzie, Leech, & Collins, 2012). Then, I labeled, identified, and defined the participants transcribed data with the adequate description to illustrate each theme. I quoted any transcribed text from the interviews with the participants' review to double check its validity and reviewed each participants' response to ensure respondent validation. In summary, I employed the credibility criteria, to find a theme similarity among the topic experts' responses in performing a systematic review of their supply chain effectiveness until no further data produce a different finding for sufficient data saturation (Larson & Chung, 2012).

Transition and Summary

After I discussed and explored the key factors in managing a limited resource like water in the FB industry; I was able to create an awareness of the emerging issues that aggravate water management in the literature review. Water scarcity is an emerging issue that could represent a risk for the sustainability of the FB industry in attaining resource efficiency. Although nature has its natural cycle to replenish water, it is essential that everyone play a role in addressing water consumption by contributing to the development of environmental, social, and economic sustainability. Moreover, the multiple-case study could serve as an example of what occurs when there is a lack of adequate consumption guidelines, policies, and other necessary measures to regulate the efficient use of water.

Furthermore, I provided an overview in a step-by-step format about how I conducted the research about the issue of water efficiency. From the actual leadership activities and experiences of global supply chain leaders and water experts, I explored the topic of water efficiency in a collective manner. The multiple-case study could assist global supply chain leaders, entrepreneurs, sustainability managers, and policy makers in acquiring a deeper understanding of their business models and sustainability views to establish a holistic, sustainable, understanding of their water management practices in the FB industry.

In Section 3, I provided a synthesis of the doctoral study's implications for the field. The multiple-case study was designed to assist global supply chain leaders, entrepreneurs, sustainability managers, and policy makers in acquiring a deeper understanding of their business models and sustainability views to establish a holistic

sustainability and understanding of their water management practices in the industry. Section 3 consists of the study findings that could serve to make sound decisions about water efficiency in the FB industry, along with recommendations for social change and further research studies.

Section 3: Application to Professional Practice and Implications for Change

Introduction

The purpose of this qualitative multiple-case study was to discover successful water strategies used by global supply chain leaders and water experts in the state of Georgia to address water management efficiency in the food and beverage industry. Agriculture is Georgia's leading economic sector and a major contributor to the U.S. economy, generating approximately $72.5 billion annually (Georgia Farm Bureau Federation, 2015). At the time of this study, Georgia was the fourth-fastest growth state, with a top manufacturing sector contributing to a gross state product (GSP) of $12,000,000,000 and 8,800 new jobs annually (Georgia Power Community & Georgia Department of Economic Development (GDED), 2014).

Georgia's agribusiness centers on harvesting, manufacturing, and trading poultry, fruits, nuts, vegetables, grains, soybeans, and value-added foods and beverages worldwide (GDED, 2015). Thirty-three percent (33%) of the 100 leading worldwide food manufacturing companies have operations or headquarter in Georgia, and more than 175 food manufacturers opened or expanded their business operations in the past decade (GDED, 2015). These factors make expansion and entrepreneurial business initiatives common themes in Georgia's FB industry

According to the Georgia Department of Economic Development (2015), Georgia is a top choice country for local and global manufacturing companies because of several pioneering factors: (a) innovatory resources, (b) viable tax organization and welcoming incentives, (c) a leading infrastructure and accessibility to global markets, (d) outstanding

logistics and transportation system capacity, and (e) top-notch technology resources (GDED, 2015). However, the release of 2015 nutritional guidelines and mandatory regulation challenge global leaders' sustainable initiatives in the FB industry and mark the transition to a shift in the food supply chain and how leaders should assume their role in society.

Presentation of the Findings

Central Research Question

The central research question for the study was: What strategies do global supply chain leaders in the State of Georgia use to address water management efficiency in the food and beverage industry? The nature of the business in the food and beverage industry is a crucial factor in implementing the best strategic approach to address water management efficiency. The threats to food safety contamination along with new nutritional guidelines and mandatory label transparency regulations, have been some of the greatest challenges in successfully approaching participants in the FB industry in relation to the topic of water management efficiency along their supply chain. However, a marked practice among successful global and local supply chain leaders and water experts in the public water utility system is a prevailing mission-driven culture contributing to the successful implementation of their business, environmental, and community sustainability initiatives.

Findings Linked to the Themes

The principal research question was designed to investigate and discover the best strategic practices used by global supply chain leaders and water experts to improve

water management efficiency in Georgia's FB industry. The semistructured interview questions aided in gathering relevant information from global supply chain leaders with leading positions and in the FB industry and with the criteria for food and water experience and expertise to discover the best strategic approaches to the implementation of their ecological, social, technical and economic tactics. The complexity involved in water management efficiency requires multiple perspectives to be able to understand and explain its importance with a deeper analysis (FBP1, 2015; WEP2, 2015).

I categorized, organized, and coded the transcribed material from 10 semistructured interview questions using Microsoft Excel, Word, and Atlas.ti7 the qualitative data analysis software. The following themes resulted from the analysis and provided a holistic insight into the phenomenon of water management efficiency beyond its environmental dimension. The resulting themes appear in Table 1 with some of the noteworthy affirmations from the interviewed participants.

Table 1

Themes Reinforced by Noteworthy Affirmations From Interviewed Participants

Themes	Participants' Affirmations
Sustainability	WEP2: Our water model is critical in reassuring that whatever we do is sustainable forever. We are all in this together in the system, and everybody along the system depends on the sustainability of water for the integrity of the system. FBP1: I do not use much water in my business, but recycling water constantly wisely influences water conservation because water can be gone in an instant! At a global scale, water is scarce, and it is a privilege to have water. It is a limited resource that we cannot take for granted and abuse its use. That is why I do not run water every day on my business! I have a specialized machine that recycles clean water. I used a triple-filter and osmosis system that is all built into the system. FBP3: I am not an intensive user of water other than for sanitation and in the bathrooms.
Mission-driven culture	WEP2: We have high standards so we can discharge water back into the lake which again makes sense because other users depend on it for their drinking water intake. We are environmental stewards. We are big in public health because we provided disinfected water. We are similar to the mission of hospitals. FBP1: I want to help more people getting healthy! I want to open more places and getting that education out there to help each community that I come into. FBP3: The founder of the business has a company culture of philanthropy. They have a legacy of providing the best quality of food. I want to continue that legacy in quality. I have been here in business for 22 years but the establishment of the business for 65 years.
Ethical responsibility	WEP2: Treat others the way you want to be treated! The water plant biological solids go down to cover the landfills and the wastewater waste goes to cover peanut holes as a soil conditioner in a plant in Georgia. FBP1: Water these days have many additives that we do not need, and I do not want my customers to have it. I believe that by using bottled water and filtered ice, I am

Themes	Participants' Affirmations
	making sure I am not putting in my customer's bodies something that I do not want in mine. I use bottle water and triple-filter in the ice machine. FBP3: I am offering products that are healthy and no other place around here offer them.
Water quality and governance	FBP1: I used bottled water because water these days have many additives. I am required by the US Department of Agriculture to keep two sinks. One full with soap solution and the other with the sanitation solution. I have to empty both sinks every four hours and refill them with water. Likewise, I have to check the acidity in the sanitation solution WEP2: We are regulated heavily by EPA. Drinking water for industrial and domestic use cannot be legally discharged because it contains chlorine. The water treatment process is a chemical procedure, and we use chemicals to disinfect and kill pathogens and bacteria in the water. We put chemicals on it to make the dirt coagulate, chlorine, fluoride and corrosion inhibitors to protect our distribution system. I have been in the solid water system for 16 years and the regulations until now are phenomenal! We are aware of the disinfection-by-product when they combine with the organic material they create DBPs carcinogens. Now we change how we treat water, and we take most of the organic out before applying chlorine which creates a different chemical composition and minimize potential hazards to health. FBP3: To me the tap water is fine. I have been drinking it for 15 years. But, I also sell water bottled here.
Food safety and sanitation	FBP1: We do not use a lot of water here in my business. However, I am required by the US Department of Agriculture to keep two sinks. One full with soap solution and the other with the sanitation solution. I have to empty both sinks every four hours and refill them with water. Likewise, I have to check the acidity in the sanitation solution. WEP2: You know we are a big poultry industry. Our potable water is critical for the industries. If we have a water main break, and water pressure goes down to zero and possibly back siphon from water into the system, we have to issue a boil water advisory. If the boil water

Themes	Participants' Affirmations
	advisory affects where the poultry plants are, The US Department of Agriculture gets involved because it is a potential for pathogens to be distributed all over the country and probably all over the world. So it is a big deal! FBP3: I am not an intensive user of water other than for sanitation and in the bathrooms.
Water conservation and climatic trends	FBP1: I am using the same water for few hours for sanitizing and constantly recycling water in my ice machine until it is iced. Conservation-wise, that said a lot! I think what we do here locally affects the globe because if everybody does a little, it does helps! That is why I do not run water all day. I use the sinks with water instead of running water constantly. So it takes all of us to help water management! I have to follow the guidelines of EPA and conserve water as much as I can. WEP2: Strategic planning and environmental assessment are critical for my business. One benchmark that we have here in the public water system is 80% only accountable for water statewide with 20% unaccounted for since we do not measure water coming out of a fire hydrant. However, we are down to 13 of 14 in Northeast Georgia. In large part is because of the Water Meter Replacement Program and an aggressively Leak Detection program with acoustic equipment to detect leaks on the ground. One benchmark you know a proof of your efficiency. When you place a value on water use, it makes people think, and we are encouraging conservation! The 2015 water projections made almost 20 years ago when the population was 108,095, now is going to be more than that by the year 2020. However, the water we used over time has not changed. Everybody use less water.
Waste management	WEP2: The water from the reclamation facilities is a biological process. We use bugs in the water to feed on organic material. So at the water plant, biological solids go down to cover the landfills, and the wastewater solids we transport to an industrial facility in Georgia and get mixed with peanut hulls and becomes a soil conditioner, which is really expensive, but is a more environmentally friendly and right way to dispose of waste. Our largest customer is in the poultry industry, and they pretreat their

Themes	Participants' Affirmations
	wastewater before it even gets to us. Their slaughter facility discharge to our plant is too clean. The water they clean in their industrial processes is so clean and below domestic wastewater concentrations which are almost a problem for us at the reclamation facility. Bacteria need to eat and feed from organic waste! They also use further processing. I know that in handling their poultry waste management, this company takes everything out from the chicken, including the organs, except the cluck and use it for pet food and supplements. This pretty efficient because they used the entire product, minimizing the waste and maximizing their profit (lean management). FBP1: I see a lot of waste in the world and the community. People do not understand the value of our resources and think they are going to be there forever. Everything has a chain reaction, a domino effect when one domino falls, the other pieces fall into it. People need to realize how important are resources and how valuable. I am aware of how water and land get polluted, and it can get thousands of years for stuff to disintegrate. I try to be careful and friendly to the environment. My cups for the smoothies are friendly to the environment. The wrap that is used for my products, the spongy popcorn is biodegradable in 90 days in the landfill. I separate the cardboard and plastic waste, and it is important to me! FBP3: The best thing to consider is if the product sells or not. I am not going to bring something here that it does not sells and get spoil.
Nutrition and the freeze drying method	FBP1: It took me a while to find an apparent company that has the products that I wanted. They are all freeze-dried, everything is completely organic which is you know another plus here, non-GMO, big deal! Everything is freeze-dried, so you still have all the nutrition in it. It is not just a powder, a cream or liquid. It is the actual banana, or strawberry or blueberry. Freeze-dried so when it hits the smoothie it re-activates all the nutrition still in there. I use high-quality ingredients to make my shakes: gluten-free protein, non-GMO, organic.

Themes	Participants' Affirmations
	FBP3: I have specialty foods here at the grocery, Ezequiel Bread, gourmet cakes, cookies, home-made salads, and meats. I also have wines and organic milk. It sells well! People that come here are looking for fresh meat, homemade salads, organic bread and bakery, and special wines and organic dairy and gluten-free cakes. The organic milk is fresh and non-pasteurized and with probiotics. I carefully select my suppliers because of the product quality. My meat supplier also serves the finest restaurants in Atlanta. We bought salmon from them, and we cook salmon here as well as chicken and beef. I am offering products that are healthy and no other place around here offer them.
Knowledge sharing and collaboration	WEP2: They slashed the education budget. What I think is contra productive. Well, employee's knowledge of effectiveness, efficiency and efficacy of the water plants is integral to our longevity and our sustainability. Education and training to people that operate the water plants operate the water systems. So training and empowerment let people have the authority to decide no this water is not going out! The process needs to change. However, we also have multiple awards, and it is wonderful and vital in the public water utility system. FBP1: I want to open more places and getting that education out there to help each community that I come into. As far as knowledge collaboration, I think everybody knows that if you look at other states like California, water can be gone in an instant! So, it takes all of us to help water management.
Water detention and retention systems	FBP1: Recycling water constantly wisely influences water conservation because water can be gone in an instant! The system is called Emax. Emax is a small electric water heater that activates hot water when needed. I am not heating water all the time especially when I am not here. My principles are to save water as much as I can, but yet I still have a business to run. So, I try not to waste any water. WEP2: We also have detention ponds, pipes, and creeks. We are planning to make detention ponds fill up to avoid discharge of water. We are going to implement a storm water utility fee on every residence, commercial and

Themes	Participants' Affirmations
	industrial building in the city limits base of the quantity of improvements to the surface. FBP3: The beers are handcrafted. The beer suppliers have special water retention systems.

The previously discussed themes resulted from the data collection interviews, literature review, preexisting companies' sustainability reports, symposiums, and government reports. The concepts center on the major threats, problems, and priorities for addressing water management efficiency in the FB industry. In Georgia's FB industry, it is fundamental to address the local and global concerns that relate to water resource management and food production.

Findings Linked to the Body of Literature

The discussed themes in Table I confirmed and extend prior findings in the literature on water management in the FB industry that took into consideration a holistic understanding of the phenomenon. Water management efficiency relates to how global leaders and water experts practice and encourage the implementation of sustainability and sustainable development practices which links to recent policy development on nutrition. Strategic planning in the FB industry and the U.S. public water system incorporates environmental assessment, climatic trends monitoring such as droughts and historic rainfalls, and the implementation of specific programs to assess water use and meet water benchmarks goals (WEP2, 2015). All those value-added activities are a common practice

among global supply chain leaders and water experts in the public system. Those activities are evidence of their water resource efficiency goals.

Sustainability. Sustainability is critical for the businesses operations in the FB industry, as well as in the public water supply system in Northeast Georgia. Sustainability and water management extend beyond environmental dimensions into the strategic planning and management of a complex resource, and also involve addressing the themes of human activities, population growth, eco-friendly technology processes, sociology, climatic changes, and distributive justice (Abel-Mgd & Hermes, 2010; Peano et al., 2015).

Strategic planning also links to sustainable development practices involves embracing a series of value-added activities and best practices to obtain the maximum environmental, economic, and social results. For example, in the public water system, a massive population growth creates the need for the strategic planning of a future city creek or a lake reservoir. Strategic planning becomes a rearranging of priorities and water usage had been reduced to maintain a constant water supply. Therefore, strategic planning is a primary activity to preserve the systems' integrity and to impose a future storm water utility fee for the improvement of the conditions of the stored water infrastructure is another example of value-added activity.

Balachandran (2012) proposed a model of sustainable development, as well as, Bosch, Nguyen & Sun's (2013) symposium article about novel ways of thinking in dealing with complex issues affecting society which seems to confirm the holistic approach needed for the adoption of the contemporary nutritional and health agenda. The

consumer trends for healthy nutritional choices predispose toward non-GMO, kosher, natural, and organic food and beverages choices confirmed the need for a holistic approach to nutrition in society. The concept of sustainability and its holistic understanding and implementation goes beyond environmental aspects to focus on other related topics to water management such as human rights, resource allocation, distributive justice, knowledge sharing, nutrition, and the role of business in society.

The research findings linked directly and indirectly to a generous amount of disciplines, other related systems to water, and to various conceptual approaches discussed in the literature review of the study. The model of sustainability helped codified, organized, and categorized the data collected from interviews, as well as, bringing to the surface other important issues related to addressing the complex phenomenon of water management efficiency in the FB industry. Consequently, other related emerging global issues such as human rights, water scarcity, food security, water conservation, water quality and pollution, and distributive justice are both a challenge and an opportunity for global supply chain leaders and water experts leading in the 21st century.

Mission-driven Culture. In the FB industry, the concept of catalytic philanthropy is a common approach. Kania et al. Russel (2014) catalytic philanthropy approach defined in the operational definitions section of the study, described a common approach adopted by some global supply chain leaders and water experts to impact transformation in society. Among the participants interviewed, in realizing the role of business in society the founder of the business donated a considerable amount of money

to impact cardiovascular health treatment and created a foundation. Transformational change then becomes part of a collaborative effort in addressing the common issues affecting society and link to effective water resource management.

Ethical responsibility. In the literature review of the study, the exploration of the concept of corporate social responsibility link water management efficiency with human rights policy integration (Voiculescu, 2011). Corporate social responsibility as previously discussed in the literature review of the study presents a unique opportunity for global leaders and water experts to promote their ethical initiatives along the food supply chain (Hartman, 2011) by integrating social learning, food security, environmental impact monitoring initiatives, and therefore recognized organizations as complex adaptive systems (Metcalf & Ben, 2012). Furthermore, the study findings also confirmed Erakovich and Anderson's (2013) statement that there is a need for cross-sector collaboration in attaining water management efficiency by promoting value across different related sectors.

Water Quality and Governance. In northeast Georgia, the public water supply comes mainly from the Apalachicola-Chattahoochee-Flint (ACF) River Basin and it is drawn and discharged in Lake Lanier. The ACF River Basin is comprised of three water bodies: (a) the Apalachicola River Basin, (b) the Chattahoochee River Basin, and (c) the Flint River Basin. Lake Lanier is the primary source of water distribution supply for most of Northeast Georgia. Therefore, sustainability planning, management, and implementation are critical for water supply distribution, treatment, and management. Likewise, as population rate increases, the water supply is vital as the demand increases,

then water sustainability is superlative for the long-term existence and maintenance of the water system and the infrastructure management. Demographic and climatic trends, land changes, and geographical challenges to water discussed previously in the literature, verified the importance of environmental, social, and system assessment in achieving a systemic understanding of water governance and in attaining both short-term and long-term water efficiency.

In the public water utility system in Georgia strategic planning link to the concept of sustainability are critical approaches to run the water system. Water leaders in the public water supply system are responsible for guarding public health, and sustainable strategic planning comprises envisioning possible and real risks link to demographic, infrastructure trends, and system water capacity projections. According to the study findings from the participants' responses, a participatory, collaborative approach (Von Korf et al., 2012). Is paramount in attaining water efficiency since everybody in the system and outside the system needs water for various, supply needs.

Food safety and sanitation. The public sanitation of the provision for drinking water is a chemical process and a top paramount priority in attaining resource quality. The Federal Drug Administration (FDA) and the United States Department of Agriculture (USDA) are the two main regulators of portable freshwater safety. Drinking water is critical for the operation of the FB industry. If there is a high risk of pathogenic contamination identified, the USDA govern in the assessment of a water safety risk as previously confirmed in the interview process to participants.

Furthermore, water quality and food contamination are also a top concern among global supply chain leaders and water experts in the FB industry. FAO (2012a) identified water pollution and water scarcity as a top global issue of increase concern. The overspill of fertilizers, manure, and pesticides are one of the main sources of water pollution. Ceres, Roberts, and Barton (2015) global case study identified water scarcity and water pollution as the FB's leading sustainability risk, and a key long-term global issue related to water use efficiency. Water quality and sustainability becomes a concern in the industry, as well as, in the country's public water supply. Therefore, it is vital to address water quality and food product contamination within a proactive, systemic, adaptive, and integrative approach that aligns with the conceptual background presented in the study.

Nutrition and the Freeze drying method. Water quality is also a dominant factor in food and beverage production, preparation, and safety. Freeze dried fruits and vegetables are a smart way and value-added activity method that aids in reducing food contamination and increase nutrition by locking the nutritional content of foods. Among the participants interviewed, the use of *freeze-dried* fruits and vegetables for the preparation of functional beverages was a novel value-added activity resulting from the *freeze drying method*. A *freeze drying method* is a novel approach of food preservation that helps global supply leaders reduce product contamination, and reduce resource consumption in the preparation of functional beverages.

Waste management. As previously stated by a participant in the study, the Federal Drug Administration (FDA), and the U.S. Department of Agriculture (USDA) are the main regulators of food and water governance in Georgia. The Environmental

Protection Agency (EPA) also regulates poultry water quality in Georgia, and FDA and the USDA are the supreme rulers of the poultry industry testing assessments. Therefore, a collaborative partnership between the government and the industry is critical to maintaining food safety and ecosystem integrity.

Water quality issues are also of vital importance in the industry to poultry waste management (PWM) to reinsure food safety and health (WEP2, 2015). The water participants feedback about handling waste management reaffirmed the importance of creating an awareness of other critical systems involved in water management efficiency as previously stated in the literature review and the conceptual framework of the study. In addressing waste management, the understanding of the link with the concept of systems of systems approach (SOS) to water management it is critical to address the water system relationship with other systems such as energy and land. Furthermore, the study findings reaffirm the value and need of a holistic approach to water management efficiency and quality assessment; the pivotal importance of this holistic approach in reducing sanitary water resource risks expressed in the participant interviews confirms EPA (2013) and FDA (2014) assessment reports on environmental and food hazard risks.

Water conservation and climatic trends. Among the participants interviewed, addressing the effects of population growth, urbanization, climatic changes, public health, and food security aid in the understanding of the system's complexity and the food supply chains which confirmed UNESCO (2012). Likewise, drought monitoring in water management practices, as discussed in the literature review by Hoekstra (2012), is critical to water management. Therefore, addressing the impact of precipitation patterns and

climatic changes directly influencing the natural renewal activity of the water systems confirmed the multiple-criteria approach to water quality in the industry, agriculture, and the public water system (Piepiorka-Stepuk, Diakun, & Mierzejewska, 2015). Furthermore, it also confirmed the holistic coordination needed in addressing emerging water management issues and risk assessment for the implementation of sustainable ways to increase water demands and sustainability needs (UNDP, 2013; UNESCO, 2012).

Climatic trends such as water shortages, droughts, and historical rainfall monitoring affect the sustainability of the public water system, the industries, and society. The poultry industries are heavy users of water, and climatic changes increase their water need for operational and sanitation purposes. Advance water sanitation systems are paramount to fill the supply chain gap. Among some public sustainability reports of global supply chain leaders in the FB industry, the smart utility water approach, the use of analytical methods, and rainwater management are a common practice in the poultry, beverage, and snack manufacturing sectors of the FB industry, which encourage resource conservation in their food facilities and for sanitation purposes. By contrast, in the functional food sector reverse osmosis, water recycling systems and water efficiency in the sanitation system and water heater systems was a value-added activity revealed in the study findings.

In poultry processing, wastewater treatment and management is an identified challenge and environmental threat. Water reuse from wastewater treatment in poultry processing facilities could convert into a product quality and disease contamination risks. Franke-Whittle and Insam (2013) study compared and contrasted the best strategic

approaches to treating and manage slaughterhouse wastes. Among those techniques are composting, anaerobic digestion (AD), alkaline hydrolysis (AH), rendering, incineration, and burning. Reverse osmosis is usually an option, but, poultry slaughtering, meat or dairy facilities require an advance anaerobic procedure or a combination of processes to remove toxic organic waste and deactivate bacteria and parasites disease-causing pathogens.

Knowledge sharing. Zangiski et al. (2013) established a conceptual framework to address the role of organizational learning. Knowledge management (KM) is critical for global companies. The outcome of gathering knowledge is organizational learning and social impact, particularly in the operations management context. Therefore, knowledge collaboration contributes to knowledge management collecting a vital factor in building organizational competence to achieve optimization of the business resources.

The use of practical initiatives then is a sign of global leaders and water expert's sustainability performance behavior and the desire to attain the role of business by impacting society in a positive way (Fontaine, 2013). Value chain analysis, life cycle assessment, and lean management initiatives are several ways to impact their sustainability performance and in attaining water management efficiency. Therefore, confirming Bramer et al. (2012) corporate social responsibility model of governance to impact equilibrium among the different needs of the users of the water system and other related systems.

Findings Linked to the Conceptual Framework

The concepts of the system of systems, adaptive resource management, and integrative resource management were the foundation for the conceptual framework of the study. The conceptual framework aid in understanding the importance of the food supply chain system, and the link with the management of other vital resources, as well as, the implementation of adaptive management to attain an integrated water resource management within a multidiscipline, multisystem, and multiapproach knowledge collaboration. The key topics identified from the data collection analysis: personal interviews, preexisting company reports, reliable government reports, conference material, and symposiums confirmed the value of the concepts in the conceptual framework of the study.

Sustainability. A sustainable and structured plan without adequate planning, action, control, collaboration, adaptation, and understanding and integration of the different systems and stakeholders involve fails its purpose. The issue of water management in the FB industry needs an understanding of a deeper standpoint and uniqueness. For example, global supply chain leaders and water experts need to adapt the strategy to the individuality of its mission, type of production, and water resource dependability with a system understanding and adaptive nature.

The concept of sustainability in a business setting involves addressing environmental aspects with the social, economic, and other relationships involve in the efficient management of water resources. In the FB industry the food supply link with energy use, land, and waste management, but also with emerging human rights,

distributive justice, demographic changes, and consumer behavior nutritional trends which confirmed the concept of integrative resource management. System thinking is critical for the system integrity, and adaptive management aid is addressing the system's complexity. Thyberg and Tonjes (2016) contemporary study pointed out the drivers of food waste and its implications for sustainable policy formulation and concluded that food waste standpoints significantly differ from different people and places. The main drivers are cultural, political, economic, and geographical which confirmed the usefulness of the concept of adaptive management.

The conceptual framework helped understand the importance of the food supply chain system, the link with the management of other vital resources, as well as the implementation of adaptive management to attain an integrated water resource management. Cicatello, Franco, Pancino, and Blasi (2016) contemporary study quantified the amount of food waste in retailing, a neglected sector and pointed out that food surplus in the United States reached 90 million tons. The multiple standpoints from different users, disciplines, systems, and knowledge collaboration contribute to providing a solid framework for decision making. Likewise, is an opportunity for a value chain analysis to reduce strategic and operational misalignment (Fearn et al., 2012; Staniskis, 2012). Therefore, global leaders could not underestimate the effect of food surplus because eventually disruptions in attaining the goal of food security could impact the effective allocation of resources.

Mission-driven cultural approach. According to the study finding**s,** global supply chain leaders in the functional retail food market share knowledge with customers,

through collaborating partnerships to aid customers making informed decisions and embracing healthy habits. Likewise, some global supply chain leaders in the FB industry successfully showed increased ethical commitment toward addressing water management efficiency incorporated with the concept of sustainability as a mission-driven culture approach leading their ethical practices in the industry. Waste management, water and energy conservation, and ethics guide their business practices in society along with the desire for expansion and to impact knowledge collaboration in society.

Ethical responsibility. The increased demand for sustainability transparency disclosure reporting encourage by new government policies, and consumer demands are chief reasons to adopt integrity in product development, packaging, waste management initiatives, product ingredient labeling business practices. According to the experience of a water expert in the public water utility dealing with diverse industries in the FB industry, some global supply chain leaders in Georgia exceed at showing environmental stewardship recycling wastewater beyond their environmental specifications. Therefore, to understand water management and achieve water system efficiency, it is critical to identify and observe the link with the management of other systems (Ceres, 2015; UNDP, 2013) as previously discussed in the literature review of the study.

Water conservation. In addressing sustainable agriculture, supply chain management, and adaptive resource management is essential to becoming aware that agricultural production impacts society, environmental, and economic wellbeing. Of the 19 to 29% of global annual greenhouse (GHG) emissions of the food systems, 80 to 89% comes from agricultural production (FAO, 2012). The agricultural sector of the economy

is not only water consuming, but accounts for 75% of global deforestation, croplands, and pasture occupation in the world's vegetated lands. Therefore, at a global scale, agriculture accounts more than 70% of all water consumption and the overspill of fertilizers, manure, and pesticides that also are chief sources of water pollution in most regions of the world.

Water quality and governance. The main concern among multinationals in the FB industry is how to manage water quality and food product contamination in a proactive manner with a systemic, integrative, and collaborative approach while minimizing the risk of reputational damage. Among the participants interviewed in the study, there is a concern for the quality of water use to prepare or manufacture food or beverages, as well as the quality of the public water supply, maintenance, and distribution. In the particular case of a business dedicated to the preparation of functional beverages, the use of bottle filtered water with a triple-filter osmosis system in the ice machine is a key value-added activity.

A triple-filter osmosis system in the ice machine, which constantly recycles clean water until it is iced, is a leading value-added activity for this type of business. Water quality is an emergent subject in many states (NRDC, 2013). The use of specific or advanced technology helps leaders improve the quality of the product, support water conservation, and facilitate attaining the goal of health and sanitation. Therefore, strategic forecasting is critical for global supply chain leaders and water experts in attaining both business and resource sustainability.

Food Safety, Health, and Sanitation. Food safety highly relates with addressing food security challenges and the strategic implementation of adaptive resource

management discussed in the conceptual background of the study. Global food and beverage manufacturers in Georgia, who lead in water management efficiency, implement critical metrics for achieving long-term financial stability and water-intensive resource sustainability. The main reason for metrics results to increased global water risks, water scarcity, and climatic changes impacting the sustainability of their businesses with shortages in water supply, which confirm UNW-INWEH (2013) global stewardship agenda, UNESCO (2012), and World Health Organization (2012). However, the implementation of an advanced water reuse treatment technologies directly related to reuse in product manufacturing is carefully considered because food quality and safety is critical to maintaining brand reputation.

Nutrition. Food and beverage production affect various systems in the entire food supply chain: (a) health, (b) environmental, (c) social, and (d) economic. Adaptive management is a viable concept to address the complexity involves in understanding the functionality of the entire food supply chain system. Change is an unavoidable factor in food and beverage production. Therefore, adaptive management could provide global supply chain leaders a valuable approach to understanding and address food security, safety, health, and nutrition.

Water quality, governance and food production. The FDA and the 2015 nutritional guidance along with changing consuming expectations are transforming supply chain management, process and product development, environmental disclosure, technology, and innovation initiatives in the FB industry. Again, confirming the vital importance of the concept of integrative water resource management discussed in the

conceptual background of the study, Bielsa and Cazcarro (2015) cross-sector knowledge collaboration from diverse disciplines, and Ceres (2015) water quality, and pollution in attaining water use efficiency commented in the literature review.

Water conservation and climatic trends. Equally, the trends of population growth, climatic changes, and, changes in land discussed in the literature review confirmed how to increased agricultural growing demands generate additional environmental, social and economic risks of achieving water management efficiency. The FB industry depends on the agricultural sector for the daily manufacturing of their food and beverage products. Therefore, the implementation of sustainable ways of agriculture can contribute to reducing water consumption, waste management and pollution, and land, as well as to decrease future environmental damage and system disruption. As confirmed previously in the literature review sustainable and green supply chain management influence the need for global leaders and water experts to adapt their business models to agricultural, population, climatic, and economic trends that affect food supply chain and water management.

Water conservation, waste management and food. The adoption of advanced technologies and sustainable agricultural methods in the FB industry foster sustainable development and improve efficient water treatment and usage. Sharma, Molden, and Cook's (2015) contemporary study discussed present trends in food consumption, production practices, and the need to improve water efficiency locally and globally, which aligns with UNESCO (2012) Report and the World Economic Forum (2015) reports addressing global risks. However, the central focus is to improve system

productivity recognition and engagement of the water-nutrient interactions at all levels by embracing effective policy development. Some global food and beverage supply chain leaders embraced policies to purchase agricultural products that meet the criteria for sustainable production. However, the issue of water management still prevails as a key cause of increased water pollution, scarcity, waste management, and deforestation.

Detention and retention water systems. Most of the leading global supply chain leaders in Georgia and water experts recognized the importance of identifying any water restraints in their food and beverage supply chain. Therefore, the identification of non-value added activities in their daily and future manufacturing operations and the implementation of detention and water retention systems transformed addressing water management efficiency within an adaptive, systemic, integrational approach vital in addressing complexity in sustainability practice. Brinsden and Lang (2015) contemporary study commented on the new requirement for a holistic food policy paradigm modification to public health, ecosystem, and food production and consumption to sustainability. The concept of adaptive management presented in the conceptual background of the study aid in the planning of detecting and eliminating the forces that could potentially interfere with the successful operation of business, society, and the economy.

Furthermore, the successful implementation of the concept of adaptive management addressed in the conceptual framework of the study relates to water management efficiency by bringing the highest value with the least production of excessive waste and environmental footprint. The conceptual framework aid in the

understanding of other links with literature review of the study, Seurig (2011) social dimension of water management, Govindan's (2011) case study of value-added activities to waste reduction, the UNESCO (2012) world water assessment report, and NRDC (2012) food waste evaluation report addressed in the literature review of the study.

Findings Linked to Existing Literature

Sustainability and transparency. The year 2015 amplified the demand for innovation over required nutritional, useful, and beverage consumption guidelines, as well as, food labeling requirements. Some global and local food and beverage supply chain leaders concern about emerging consumer behavioral trends. The increasing obesity rates, diabetes, and heart diseases cases are the primary reasons for consumer behavioral choices toward naturally sweetened, low-calorie, low sugar, low-fat, non-GMO, whole grain, and organic food and beverages choices (Dietary Guidelines Advisory Committee, 2015).

The current literature on sustainability provides novel and significant standpoints. For example, the need for increased labeling transparency in food and beverage production. Quinto, Tinoco, and Hellberg (2015) contemporary study revealed the need for greater food labeling content transparency and commented on novel methods of DNA barcoding to detect meat mislabeling of other animal species. Quinto et al. (2015) study discovered the legal commercialization of vulnerable species in 10 of 54 commercial spirited meat products tested.

Kane and Hellberg (2015) contemporary study identified 10 of 48 ground meat online and retailer products tested with mislabeling issues containing additional DNA

species not properly disclosed. However, the highest rate of product mislabeling was among online distributors. Therefore, food transparency and labeling of the nutritional content of food and beverage products is one of the contemporary and novel leading topics in food and beverage production. The study findings confirmed and extended the awareness and understanding on the themes discussed in the literature review of the study including new emerging studies since the writing of the study.

Nutrition and the freeze drying method. The 2015 nutritional guidelines expert recommendations focused on the importance of minimizing nutritional deficiency for optimal health. The guidelines addressed the need to minimize the overconsumption of sodium, saturated fats, and refined sugars, which have a high-risk potential of cardiovascular diseases, diabetes, and obesity (DGAC, 2015). The DGAC committee stated the lack in the consumption of fruits, vegetables, whole grains, and dairy in children's and adult's diet. But at the same time there is an imminent contradiction because the "shortfall of nutrients" underconsumption of key nutrients in attaining the goal of nutrition and nourishment create a valuable opportunity for global leaders to innovate with the manufacturing and preparation of functional foods and beverages that aid in preventing disease and help to attain a healthy lifestyle.

The 2015 Dietary Nutritional Guidelines for Americans are paramount for global and local supply chain leaders' food and beverage strategic innovation and production. The nutritional guidelines are a policy response toward healthy dietary choices trends and marked the beginning of a holistic approach to nutrition, adaptive management, and system thinking. One unique theme in the data collection analysis among the participants

interviewed was the *freeze drying or lyophilization method* for functional beverage preparation and to reduce the risk of food contamination.

The freeze drying method emerged from the study findings as an innovative strategic approach to address contemporary global food security challenges and processing. The freeze drying or lyophilization method for fruits and vegetables is a contemporary way to minimize food waste and decay, save water, conserve energy, and money. The lyophilization method also creates the opportunity to link value creation with cost evaluation for optimal value resource management. Likewise, lyophilization or freeze drying is a beneficial and convenient way to maintain a healthy lifestyle.

In summary, the freeze drying method is an innovative way of food preservation with a high nutritional potential choice for no sugar added, non-GMO, vegan, no fat, no additives, no dyes or preservatives, and for its high content and kosher nutritional choice. The previously factors confirmed the need for adaptive management, system understanding in water management and food preparation with a holistic and integrative approach. The conceptual background of the study aid global leaders and water experts understand water management and its complex food supply links needed for attaining resource sustainability beyond its environmental dimension.

Food safety. Freeze drying removes 98% of humidity in food and extend the shelf life of a fruit or vegetable product by five years reducing risks of food decay and facilitating transportation because it also reduces the product weight and rehydration (Jon-nwakalo, 2015). The freeze-dried method could be a viable option for decreasing the risk of food contamination and environmental waste. Therefore, an efficient method to

achieve sustainable food and beverage production with less environmental footprint and preserving ecosystem integrity.

Water conservation and waste management. Furthermore, the absence of water minimizes the need for additives to preserve food and since freeze dried produce is naturally ripened and frozen immediately after, the process help lock original nutrients, taste, pigment and consistency of the fruits and vegetables (Jon-nwakalo, 2015). Meat, cheese, yogurt and ice cream manufacturing could benefit from the freeze drying method, as well as extend their shelf life. Therefore, freeze-dried foods offer manufacturers, retailers, and consumers mutual benefits: (a) high product quality and extended shelf life, (b) cost saving method, (c) water use conservation, (d) effective waste management, (e) low food contamination, (f) an effective survival and sustainable method, (g) an efficient way of food transportation, and (h) a viable method to address hunger in developing economies worldwide.

Nutrition and governance. The Dietary Guidelines Advisory Committee (DGAC) recommended a modern plant-based balanced approach to nutrition which consists of a higher nutritional intake of fruits, vegetables, fiber, nuts, seeds, and whole grains to promote health and sustainable production (DGAC, 2015). The resulting contemporary policy is an invitation to shift the current deficient nutritional choices for a vegetarian and low-calorie intake approach. This vegetarian approach will aid policy leaders moderate overconsumption in society, as well as, promote the goal of optimal health with a balanced approach to nutrition as previously confirmed in the literature review of the study (Staniskis, 2012). However, the identification of a deficit in nutrients

is the beginning of attaining system thinking (ST) and system of systems (SOS) because it has been linked in the scientific literature to adverse health outcomes (Appendix E).

Water conservation and climatic trends. The major concern among manufacturers of food and beverage is to stimulate a sustainable approach without increased environmental impact, land use, greenhouse gas emissions, water, and energy consumption. The *freeze drying method* could be a novel viable approach to attain this goal. Therefore, food processing and waste management reduction are vital to preserving environmental safety and system integrity. However, in the public water system rainfall monitoring, drought and population are critical areas to consider in relation to sustainability and strategic planning implementation.

Waste management. Wastewater treatment and reclamation for water reuse is critical to a quality supply of water. Technological innovation in wastewater treatment and reclamation is a vital process in water supply and management. Water reclamation plants need constant monitoring and upgrade to improve wastewater treatment infrastructure. According to a participant interview, the water from the reclamation facility is treated with a biological process. *Anaerobic digestion* is a high quality and environmentally friendly option for water management in the poultry industry.

In the public water utility system, water experts use a biological process, known as an *anaerobic digestion process* to advance wastewater treatment and water reuse. However, the challenge involved in using this method is the potential high risk of fouling since the use of healthy bacteria depends upon the organic material to nourish constantly and become effective. By contrast, the water for distribution and supply require a

chemical process known as chlorination. Chlorination is an efficient method for disinfection of public water supply and is an effective strategic approach to killing bacteria and avoid the risks of waterborne diseases.

According to a participant's standpoint, the chlorination method in the public water utility system aid to further protect the quality of the treated water. However, there is still a health risk from pathogens that are resistant to chlorine. Moreover, the resulting and unintentional chemicals compound formed from the disinfection by-products (DBPs) and other chemicals reactions to natural organic waste create a water quality challenge (Water Quality & Health Council, 2002; WEP2, 2015).

The Environmental Protection Agency (EPA) current legislation, under the Safe Water Drinking Act (SWDA), set regulatory standards for the use of chemicals to protect human health and on the quality of water systems that use an advanced sanitation technology. As stated by the participants in the study microbial and pathogen contamination is a paramount urgency. Therefore, the constant assessment of the PH balance in the water, as well as, the chemical composition monitoring of the public drinking water are value-added activities of supreme relevance in attaining water quality and safety.

Ethical responsibility. In the public water system, the health risk resulting from the DBPs formation in water treatment for drinking and sanitary distribution supply is minimum compared to a high risk involve in sidestepping adequate disinfection in water. The complete avoidance of chlorine is life threatening as confirmed by a participant's interview. There is a higher health risk involve in the incidence of waterborne diseases.

Therefore, in the public system, a small concentration of the chemical is highly recommended instead of total chlorine avoidance in treating water for drinking and distribution purposes. However public safety and health are a key factor in attaining environmental stewardship and in addressing environmental, social, and economic sustainability. A casual loop diagram analysis could help global supply chain leaders and water experts gain a deeper understanding of the phenomenon of water management efficiency and the systemic, adaptive, and integrative implications to other critical resources and multidiscipline concepts.

Similarly, encouraging the reduction in the use of fertilizers and pesticides in agriculture will aid in the unwanted concentration of chemicals and radicals in water. The concern for water quality among the participants interviewed, as well as, EPA, FDA, government reports, and Harms (2011) symposium are an evidence of the significance of cross-functional integration in attaining environmental sustainability and supply chain management.

Water conservation and food safety. Water efficiency strategies, programs, and plans are a strong way to minimize bottom-line operational risks. The Federal Drug Administration, hazard control point principles (HACCP) rules on food security targets and requires poultry processing plants to increase water use to minimize the occurrence of product contamination (FDA, 2014). However, when water supply becomes an issue due to climatic changes such as droughts, the implementation of water reuse systems is critical for sustainable operations and regulatory compliance for meat and poultry manufacturers.

Water quality and governance. Moreover, the U.S Food and Drug Administration (FDA), Hazard analysis critical point (HACCP) rule food safety. HACCP is a management system to address food safety regulations, which also apply to juice processing and packaging, retail and food service, dairy, poultry, meat, fish and seafood safety handling (FDA, 2014). The HACCP controls biological, physical, and chemical hazards related to raw material handling, manufacturing, and distribution. Therefore, the implementation of other investigative and strong systemic methods inside and outside production are significant in preserving product and environmental integrity.

However, there are other advanced methods for assessing water consumption and water treatment. The type of food or beverage production, the nature of the business, and water consumption link to product or non-product procedures will determine the level of water treatment suitable for water consumption monitoring and compliance. Therefore, in the selection of the best strategic approach to achieve water management efficiency influence different factors. However, Georgia is mainly a poultry industry, and potable water is critical for the sustainability of industrial operations. The exploration with four, public sustainability reports and EPA reports exposed the following strategic approach for water management efficiency:

a. The *water-to-beer ratio approach* in a brewery manufacturing is an indicator of how well a company is at reducing their water use directly associated with the manufacturing of their product. Most U.S. brewery companies use more than six containers of water to produce only one container of beer. Sustainability and

knowledge collaboration partnership play a significant role in managing their watershed sustainability strategies (Miller Coors Sustainability Report, 2015)

b. A controlled *water supply system (RO)* approach in an animal processing facility is suitable for helping global supply chain leaders meet food safety compliance with other business operations not directly related to product manufacturing (EPA, 2012).

c. *Rainwater management approach* for a poultry manufacturer is highly recommended for odor control and equipment safety for sludge processing equipment and sanitizing.

d. The *water use and quality approach* in a diversified food portfolio company with snack-food processing and other food preparation, the water utilization and quality approach help global leaders track their water use on a monthly basis and set reduction goals for their most water intensive food manufacturing or sanitation requirements. Collaborative partnership with farmers contributes to lower their indirect water use and the zero-to-waste landfill approach aid at reducing environmental waste (ConAgra, 2015).

e. *Anaerobic approach* for snack-food companies were sanitation requirements for disinfection is useful for managing their direct water use for food production.

f. The *water blueprint approach* helped some global beverage manufacturers leaders established key water footprint targets on a world scale focusing on the company's supplier acquisition of raw material, water use in the manufacturing

and operation of the business, and the establishment of sustainability programs in the community (Diageo, 2015).

Therefore, the risk involves in addressing food safety and quality is a paramount concern in addressing water management efficiency particularly in Georgia, a global leader in poultry manufacturing and exportation. Sustainability programs increase global supply chain leaders local and global water stewardship commitment. Likewise, among those collaborative partnerships and sustainability initiatives are the CEO Water Mandate and the Beverage Industry Environmental Roundtable. Therefore, using an integrative water management approach and a holistic stakeholder approach in tackling water resource management and benchmark efficiency goals could be effective in addressing water management efficiency. One benchmark in the public water system is water accountability. The account for water in the public water system is 8% statewide which is 20% unaccounted for water. In the public water system, only a third of the water coming from a line of a household is accounted. Furthermore, the water coming out of a fire hydrant is unaccounted and the aging water meters over time made water accounting a challenge.

However, in the public water system, a practice over time involved decreasing the amount unaccounted for water. In North Georgia, there is a 13% - 14% unaccounted for water. The main decrease attribution is the implementation of the Water Meter Replacement Program and a forceful Leak Detention Program with acoustic equipment to detect water leaks on the ground. The program implementation is a value-added activity are a proof of attaining efficiency in the public water system.

However, the increase and the common efficiency goal encompass reducing the accountability for water with an index. The Environmental Protection Division (GAEPD), a division of the Department of Natural Resources watches the public water system in Georgia closely. According to a participant interviewed, the Disinfection by-products (DBPs), the carcinogens formed by the process of water treatment for potable water become a health risk challenge. However, the process of water treatment had changed over time, and more oxidation is added in the water treatment process to decrease the concentration of DBPs and lower the incidence of health cases in the community. Therefore, Georgia is an enforcer, an active water conservation state, and a leading example to other neighbor countries who share their water supply needs.

Food safety and health. Poultry and meat production manufacturers face the threat of serious foodborne illnesses that required extreme sanitation procedures in the operational handling and packaging of meat production. In Georgia, food experts from the UGA Center for Food Safety identified Salmonella as the primary source of food contamination in poultry and other types of meat production. Food safety is the primary reason for intensive water use in a product, sanitation initiatives, as well as, the handling, preparation, and nurturing of the chickens. Listeria monocytogenes is another possible foodborne pathogen in meat production and processing. Twofold treatments with 60 minutes Ozone and 10 minutes UV light are critical for foodborne control in new and used chill brines (Kumar, Williams, Summer & Elfers, 2015). The topic of water treatment in new and used chill brines (sodium chloride in water) for seasoning and

cooking add another level of complexity to address water management efficiency in the FB industry.

According to EPA, drinking quality for direct food contact is a possible option for areas of scarcity where groundwater supply is limited, but this will have required a system optimization and higher costs (EPA, 2013). However, water supply in Northeast Georgia comes mainly from surface water, and river basin withdrawal management is essential to protect the habitat of oyster critical for the economy of neighbor countries. Water conservation as an effective business initiative in food and beverage production and water supply management involves more than just effective resource management. Likewise, food processing, sanitizing practices, cleaning and system sanitation required an advance technological implementation to re-use proficiently water in production. Therefore, at a local and global scale, the limited use of water is a viable options approach for addressing resource overconsumption and waste management.

Knowledge Collaboration. Global and local supply chain leaders show an increased commitment to empowering themselves and their employees about the critical importance of efficiently managing a limited resource. However, the risk of food safety and contamination is a constant threat that could severely impact the quality of their food and beverage products. Food security is one of the main challenges of choosing a water management efficiency approach.

The water management efficiency approach will depend on the type of business and its products. However, the adoption of an efficient system requires the implementation of a reliable water system. For example, for a health store and smoothie

bar, an osmosis system with triple-water filters in the ice machine constantly recycling clean water is a possible option. This system is reliable in addressing water quality and water and energy conservation. The U.S. Department of Agriculture (USDA) required local and global business involved in food and beverage preparation to keep sinks with a sanitation solution and a soap solution and monitor the PH balance of the water after a particular period for additional sanitation security.

The previously commented value added activities help food and beverage leaders save water, conserve energy, and reduce operational costs. Some leading beverages companies in Georgia identify a water resource-intensive activity and use metrics and the data-driven information as a common adaptive management practice. The value-added activity of increased knowledge collaboration and the strategic planning to anticipate risks, help leaders in the public water utility make informed supply chain decisions.

Strategic planning and ethical responsibility. Furthermore, beverage companies and poultry facilities are highly water and energy consumers and waste generators, which could result in an increased environmental footprint. Therefore, strategic planning with useful benchmarks and water goals aid leaders plan for future resource sustainability positioning and citizenship. A confirmation of the value of the integrated water resource management concept addressed in the conceptual background of the study. Therefore, global leaders understanding of the significance of integrating their social, scientific, and community sustainability initiatives encourage attaining water management efficiency.

Water conservation, energy, and gas emissions. The water, energy, and carbon Nexus also result from the data collection analysis process. From the study findings,

Eemax resulted as a novel tank-less water heaters systems that aid to reduce water consumption, save energy and reduce the carbon footprint on the environment. In the particular case of a food and beverage natural health food centers and smoothies bar, a participant interviewed recognize the critical importance in maintaining the quality of water to operate their business in an ethical manner.

Water and geographic challenges. Likewise, of critical importance is addressing geographical challenges to potable water, the amount of water use in agriculture, the manufacturing of products, rainwater management, recycling, and advance technology investments to reduce waste in the industry. The geographical challenges to water, and in particular countries like Georgia who share their water supplies with other countries like Florida, and Alabama confirmed the relevance of the systems theory identified in the conceptual background of the study. The system theory help leaders understand the value of the ecosystems involve for preserving the system integrity and safeguard the sustainability of other marine species critical for the economy of other neighbor countries.

Waste Management and value-added activities. In reviewing five public sustainability reports of various global supply chain food and beverages manufacturers in Georgia, some global supply chain leaders implemented the concept of lean manufacturing, as an effective strategic approach to minimize system waste and deliver value. Lean manufacturing proactively prevents future workflow disruptions and identifies waste along the supply chain to eliminate surplus in different business operations such as production, transportation, processing, and labor utilization to

optimize its value. Therefore, lean manufacturing is a way to attain manufacturing excellence by reducing waste and changing the operational dynamics of business to identify all the value-added activities that can increase bottom-line performance.

Applications to Professional Practice

At a local and global scale, water management efficiency could attain a multidiscipline and holistically approach by addressing every single phase in the food and beverage supply chain. The adoption of advanced water-reuse equipment, sustainable animal care and eco-friendly approaches to food security and crop development could provide an integrative approach to water resource management.

Water quality and conservation. For example, in agriculture, a highly intensive water consumption sector of the economy, the rainwater collection approach for crop production could facilitate water consumption with less use of pesticides unsafe for human and ecosystem health balance (FAO, 2012; Mesa-Jurado et al., 2012; Von Korf et al., 2012).

Waste management and systemic analysis. The management of other critical systems related to water resource efficiencies such as energy consumption, land, and greenhouse emissions could contribute to improving water resource management within a collaborative, holistic, multidisciplinary and knowledge collaboration approach for long-term water resource sustainability (Angrill et al., 2012)

Mission-driven culture and leadership. Equally imperative for improving business practice is knowledge collaboration at all operation and supply chain levels by leading by example and empowering not only employees but a society with leading

examples of honoring life, attaining water resource efficiency, and promoting ethical practices (Mesa-Jurado et al., 2012; Staniskis, 2012).

Water conservation and climatic trends. The prudent managing of limited resources is critical for future life and ecosystem sustainability (FAO, 2012a; Forouzani & Korami, 2011; Michelini & Fiorentino, 2011)

Environmental stewardship and ethical responsibility. Business leaders could positively impact a change in thinking for a more proactive and holistic thinking that could provide an integrative vision from common knowledge (Bower, 2012; Birkin & Polesie, 2011; Staniskis, 2012).

Multidiscipline knowledge and cross-sector collaboration. A multistakeholder collaboration approach with a joint effort and vision to address overpopulation and reduce overconsumption with a cost-operative approach will help emphasize the need for a value chain analysis to minimize strategic and operational risk resource and misalignment (Fearn at al., 2012; Staniskis, 2012).

Implications for Social Change

The implications of the study for global food and beverage supply chain leaders, entrepreneurs, communities, stakeholders, shareholders, non-profit organizations, government, and society is in the manner that the resulting strategic approaches to managing water management efficiency could positively affect social change. Bergold and Thomas (2012) stimulated future research in the integration of the concepts of the participatory approach and *safe space*. Global supply chain leaders could further contribute to educating and foster water resource and energy conservation measures with

an opportunity to decrease operational costs, over-consumption practices, overproduction, destructive health practices and increasing efficient waste management practices in society. Furthermore, water and energy conservation measures reaffirmed the relevance of the participatory water management approach (Bergold & Thomas, 2012; FAO, 2012a; UNDP, 2013; UNESCO, 2012) in dealing with the management and the strategic planning of a complex resource. Therefore, in attaining water efficiency is critical to understand that water management involves everyone: (a) the government, (b) the public system, (c) society, (d) the industry, (e) the economy, and (f) the environment. A change in one system can affect other systems integrity and functionality.

Recommendations for Action

The recommendations from a multiple-case and multi-purpose food and beverage production centers around strategic ways to proactively, collaboratively, and systemically address water pollution, waste management, wastewater management, and system degradation. The following value-added activities could become a viable solution for addressing water management efficiency within a collaborative approach:

1. Sustainability: Education plays an important role in creating awareness in society, and it is essential to embrace, understand, and be open to unlimited options.
2. Mission-driven culture: By empowering employees with system knowledge and skills to help preserve and honor the long-term sustainability of the water resources in the public system with an established succession planning.

3. Water quality and governance: By adopting, fostering, and implementing a policy development link to waste management and the potential risks involve in population increase and global warming.
4. Waste management: By innovating in the adoption of eco-friendly and sustainable technology for food safety.
5. Wastewater treatment: By encouraging knowledge collaboration on a global scale in countries were addressing wastewater treatment, water quality, and water conservation are critical to the health and reduction environmental footprint.
6. Food security: By implementing an effective program that fosters and subsidies local production and innovation for the purpose of attaining a plant-base nutritional approach accessible to everyone.
7. Ethical responsibility: The FB industry, society, government, and the environment could all benefit by paying close attention to business practice, society behavior modification and policy development with increased sustainability transparency to impact proactively and strategically sustainable food and beverage production with a dual purpose: global food security and water management.
8. Knowledge collaboration: the multiperspective, multidiscipline and multistakeholder knowledge collaboration enable global supply chain leaders and water experts address resource efficiency with the needed tools to identify, allocate, and control water use and conduct a value chain analysis for system and subsystem kinks to safeguard the system limits and minimize strategic and operational misalignment.

Recommendations for Further Research

The need for further research in relation to improving business practice identify how the limitations in Section I could improve with future studies by encouraging further eco-friendly initiatives that promote awareness of the significance of strategic planning and preserving the system integrity. These initiatives could involve addressing: (a) waste management and sanitation, (b) life cycle system assessments and value chain analysis that honor the natural integrity of the water systems, (c) decrease waste generation, (d) innovative ways to reduces transportation weight and food security issues, and (e) reducing food and water contamination for future sustainability.

The relevance of strategic planning focuses on adaptation and change. Freeze dried is a secure method of food preservation, safety, and security that in addition to ensures enzymatic nutrition it is also an eco-friendly approach to *waste energy*, *water*, and *land resources*, as well as, *overconsumption*. The future evolution of humanity depends on adopting the best behavioral and strategic approaches to address future uncertainty and complexity taking into consideration that knowledge is limited because it constantly need adaption to change. Change is inevitable and is critical to start today and look for sustainable and life-preserving and cost reducing alternatives for a more sustainable future.

Reflections

The DBA Doctoral Study process was an eye opener to change, the importance of embracing feedback, infinite possibilities, and certainly a reaffirmation of the importance of continuous learning, trial-and-error and the ethical commitment to the important role

of business in society. The participants in the study certainly projected a passion and a strive for improvement, as well as, a leading example of what it takes to conduct business in an ethical manner. Sometimes knowledge can come from the least expected persons and places. In the FB industry, is critical to approach complexity and uncertainty with a broad selection of possibilities without misplacing the meaningful representation of business integrity.

Learning is everywhere you show a genuine commitment to improvement and change. I become aware of the importance of water conservation, waste management, and overconsumption to attain water management efficiency and to sustain life on the planet. However, there is still much to do to educate and impact society toward a different mindset about the priceless value of water. If the trend of evolution continues the way it is right now and human activities increase, what is going to happen with the long-term sustainability of the planet.

Summary and Study Conclusion

Water management understanding comprised gaining a holistic insight of the different systems, disciplines, and users involved in realizing efficiency in water use and management. Water management affects food security, food safety, carbon dioxide emissions, economy, social learning, health, land, society, and the environmental impact assessment of other systems involve a collective approach. Therefore, a single strategic approach to understanding and attaining water management efficiency will not contribute to a holistic understanding of this complex phenomenon. It is vital to acquire an adaptive, and integrative understanding of the interdependence involve in attaining integration of

the concepts of water management efficiency and sustainability for acknowledging and addressing system's risks and its relation to other systems. However, Alen, Fontaine, Pope, and Garmestani (2011) study pointed out that the evolution of knowledge is continuous and constantly changing, and unfinished. Therefore, Hill (2013) recent findings commented on the importance of embracing rather than controlling complexity in addressing climate change and water governance.

In summary, the feedback received from multiple standpoints aid in the implementation of new policies, regulations, innovations, new ways of thinking, and in addressing the emerging complexities in adapting and coping with future demand issues affecting the sustainability of water resources as a system. The recognition of infinite possibilities, infinitive outcomes that will influence change and transformation in a scenario of continued uncertainty, complexity, and emerging challenges. Knowledge collaboration aid in creating the needed education awareness in society about the use of pesticides, chemicals, and other critical environmental spilling that can impact the quality and manufacturing of various food and beverage products and the quality of water.

However, the adoption of the best strategic approach to attaining water management efficiency in the FB industry depend on the following factors: (a) the type of food or beverage production, (b) the nature of the business, and (c) the use of water linked to direct business operations or indirect connected processes. These key factors will determine the level of water treatment suitable for water consumption monitoring and compliance, as well as selecting the best strategic approach to attaining resource efficiency. The resulting knowledge collaboration helps to provide an integrated

approach to address the relationships and system's associations with water management and other related resources such as land, energy, and food impacting social, industry, and environmental welfare. Likewise, knowledge collaboration provided an adaptive, integrative, and system's approach to addressing water management efficiency without the need to compromise sustainable development and ecosystem integrity. Water management is a collaborative effort that involves everyone as a team since every action influences water sustainability for every user in the food supply chain.

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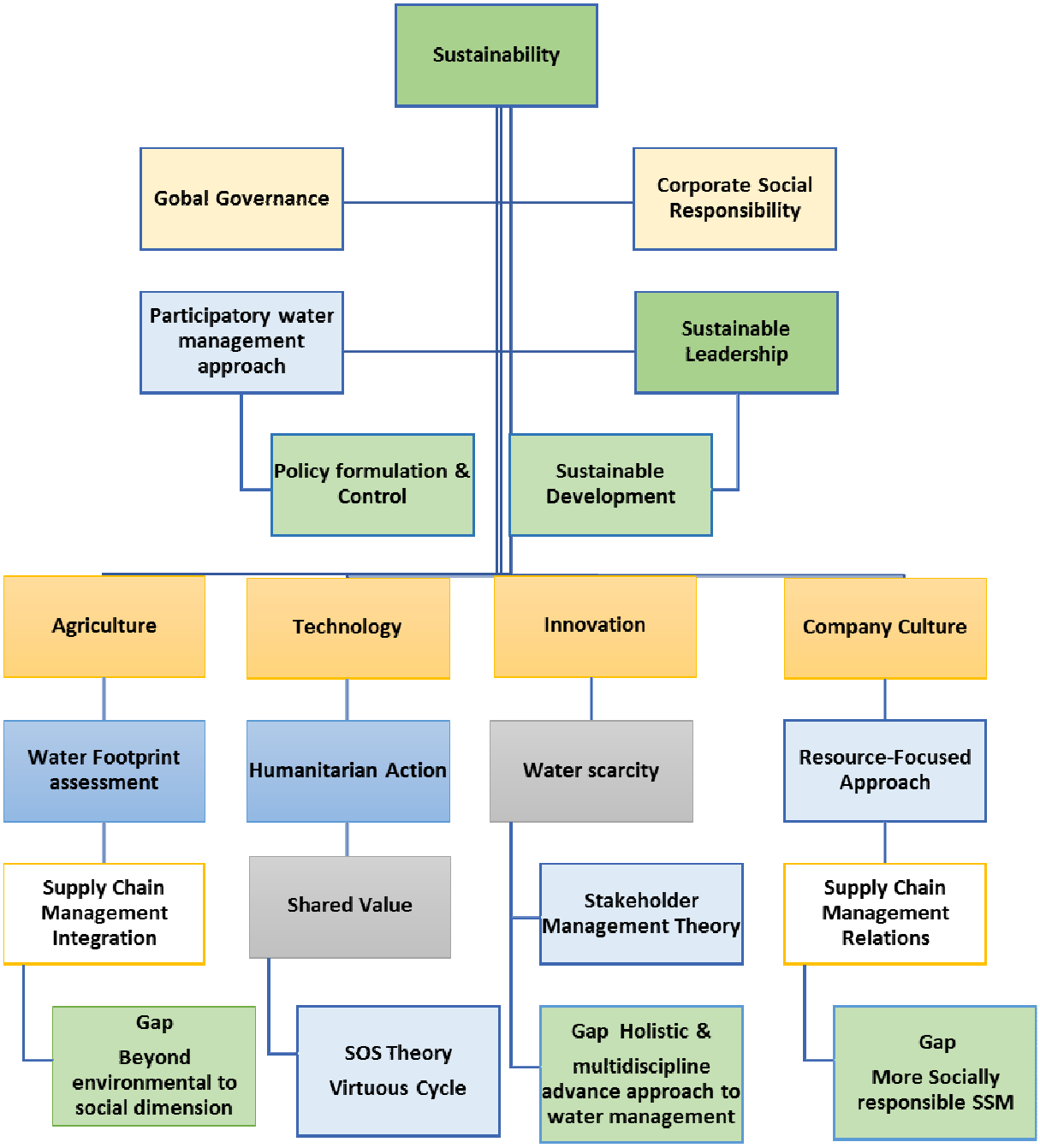
Appendix A: Interview Questions

1. Why strategic planning and environmental assessment is critical for your business sustainability?
2. How do you manage and mitigate water risks along the food or beverage supply chain?
3. How do you integrate the company's value-added activities with the country's water benchmarks in your region and the company's strategic planning implementation?
4. How do you manage water resources with other dynamic resources needed for bottom-line performance?
5. How global water management governance and knowledge collaboration influence strategic planning and water resource efficiency?
6. How do you cope with demographic and climatic trends at corporate and public policy levels?
7. How effective are your value-added managerial principles in attaining water management efficiency?
8. How effective is your company's strategic planning implementation at addressing complexity and managing risk along the supply chain?
9. How critical is waste management to your company?
10. How does your company culture influence water management and strategic planning implementation?

Appendix B: Literature Review Outline



Appendix C: Invitation Cover Letter

Dear Global Supply Chain Leader or Subject Expert,

I am performing a research study in Georgia to gain a better understanding of the water management practices in the food and beverage industry. The study purpose is to explore with the actual experiences of global supply chain leaders, and water experts in Georgia who has experience in water management efficiency. As a global supply chain leader or topic expert on water management in the food and beverage industry, you will be asked to collaborate in a doctoral study regarding the issue of efficiency in water management. The researcher's aim with the study is to discover effective business models and policies among global supply chain leaders and water experts in FB industry who has experience in water management efficiency.

If you agree to participate in this study, you will participate in a face-to-face interview, which will encompass a duration of 1 hour. Your participation in the doctoral study is strictly voluntary. After potential interviewees agree to participate in the doctoral study and to the terms of the consent form, potential participants will learn about the interview process and will be able to respond to semistructured, open-ended questions directly related to the purpose of the study. All the information supplied by the participants is confidential. Furthermore, at the participants' request, I am willing to share the study outcomes with the participants and the community stakeholders.

Appendix D: Participants Consent Form

Dear Global Leader or Subject Expert,

As a global leader or expert in water management, you are asked to participate in a research study regarding the best sustainability and strategic approach to achieving efficiency in water management practices in the food and beverage industry. You may already know me as a small business owner of handmade jewelry design. However, this role is apart from the role of a researcher. For achieving the purpose of the study, I am inviting global supply chain leaders and water experts across Georgia who have experience in water management and global supply chain management or a master's degree or specialization in water management practices, supply chain management, environmental science, system engineering, technology, metrics, resource sustainability, and a leadership position occupied in the selected multinationals to participate in the multiple-case study. This course is part of a process called "informed consent" to allow you to interpret this study before deciding whether to participate. Please read this form and contact Maria to ask any questions you may have concerning the subject prior to agreeing to participate in the doctoral study.

Maria Del C. Reyes Torres, who is a doctoral student at Walden University, will conduct the study. The researcher's objective is to explore the current experiences of global supply chain leaders and water experts about effective water-resource management practices, in the food and beverage industry to discover effective approaches to addressing water management efficiency. If you agree with the study's information and would like to participate in this research study, please reply to this email saying: "I

understand and agree with the study's terms described previously" to identify you as a potential participant. As a participant, you will contribute with a face-to-face interview that will last about 1 hour to complete. The process of the participants' interviews will consist of a face-to-face interview to respond to 10 semistructured, open-ended questions such as the following:

1) Why strategic planning and environmental assessment is critical for your business sustainability?
2) How do you manage and mitigate water risks along the food or beverage supply chain?

Your participation and contribution to the doctoral study is voluntary and confidential. You have the right to decline participation at any time without any personal implications to your reputation or services. As a potential interviewee, I included a sample of the interview questions before you agree to participate in the doctoral study and its terms. I am also requesting your authorization to record the interview process with the commitment to save the digital recordings with a password protection in my computer only known to the researcher. The digital information and transcribed data will be kept for 5 years in my computer, and then I will erase and destroy all the previously documentation after this period to protect your confidentiality and assure the reliability of the data collected.

The information provided is confidential, and its use will be exclusively for the purpose of the study. There is no study's risk associated with your safety or wellbeing

rather than just a probable minimum discomfort from daily life activities such as tiredness. Likewise, there is no compensation, gift, or reimbursement offered for participating in the research study. However, the benefits related to the research will help other professionals to further their knowledge about efficient water management practices in the industry. Furthermore, I am willing to share a summary of the findings with the participants.

Likewise, the study will support the decision-making process associated with the management of a critical resource in the FB industry in Georgia and contribute in a positive way to social change. Also, the researcher will not disclose your personal information and will honor your privacy by using a pseudonym to protect your identification in the doctoral study. I will also keep the physical data for 5 years in a secured locked safe, as Walden University requires it. I will also provide participants with a compendium of the study to encourage mutual benefit of the study outcome.

For further questions about the study, you can contact Maria Del C. Reyes at (XXX) XXX-XXX or by e-mail address at XXXXX. If you have any questions about your rights as a participant, please contact Dr. Leilani Endicott to discuss your participant's rights privately. Dr. Leilani is the designated Walden University representative who is accessible to discuss the above information with you. Her phone number is (XXX) XXX-XXXX. Walden University's approval number is 09-22-15-0368709, and it expires September 11, 2016.

Please retain a copy of this letter for your records. Please reply by e-mail stating your written consent with the study's terms as: After reading the study's information, I understand and agree with the study's terms described previously. However, after I transcribe the recorded interview, I may need to arrange another interview for transcription-verification and to verify the accuracy of the information. I would like to conduct both interviews in a public place or library with an authorized access to a closed and confidential room to protect your privacy. Thank you for your collaboration.

Sincerely,

Maria Del C. Reyes Torres
Walden University School of Management and Technology
DBA Candidate: Specialization; Leadership

Appendix E: Network of Codes to Shortfall of Nutrients