From Green Purchasing to Green Supply Chain Management
—a single-case study of Guitang

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Abstract

Sustainable development is an eternal topic and the enterprise’ sustainability provides the answer. Furthermore, emerging market’s sustainable development is frequently mentioned recently due to the serious pollution and waste due to the blind pursuit of higher GDP (Colm, 2012). This paper aims to find out the drivers and barriers of green supply chain management (GSCM) implementation; and figure out how to strengthen the relationship between green purchasing (GP) and GSCM based on the single-case study of Guitang Group. Combining the qualitative and quantitative method, we try to explore and describe the influence on GSCM development caused by the specific background of China. Based on the suggestions of how to strengthen the relationships between GP and GSCM, it will be more efficient for us to find a suitable way for manufacturing industrial companies in China to achieve the path from green purchasing to green supply chain management.

Key words: Sustainable, Purchasing, Supply chain management, Circular economy, Green purchasing, Green supply chain management, China, single-case study
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1. Introduction

1.1 Background

Facing the increasing environmental problems and severe competition situation, emerging markets, especially for the Chinese companies, have recognized the importance of implementing “Green” concept especially in manufacturing industry. Green purchasing seems to be the first step to companies’ sustainable development, while it is not enough to form a systematic and complete system. Nowadays, companies start to put environmental conscious into the whole supply chain management called as Green Supply Chain Management (GSCM) (Hervani et al., 2005).

Walton (1998) comes up with environmental issues that have been regarded as an inherent part of strategic planning. Compared to the developed market such as Europe or the US, the concept of green supply chain in China is not well formed and recognized. There is an inevitable trend that companies integrate sustainability issues to the whole supply chain management rather than just focus on purchasing process (Muduli et al., 2012; Vachon & Klassen, 2006). Companies have generally accepted the drivers, such as financial and attitude issues (Muduli et al., 2012; Walker et al., 2008; Mathiyazhagan et al., 2013). However, from the researches done by Zhu (2005), this awareness of sustainability has not been translated into strong GSCM adoption in Chinese companies. The environmental awareness study in china is still a gap. Hence, the implementing and evaluating of green supply chain management is still a big problem for the Chinese companies (Zhu and Sarkie, 2004, Zhu et al., 2011).

Several articles show that purchasing cost for environmentally friendly materials is considered as the most important factor in the Green Supply Chain Management evaluation (Jiang and Zhou, 2012; Lin, 2013). Green purchasing is not only a component of ISO 14001, but also an important part in companies’ green practices. Nowadays, it is accepted and conducted wildly in
China (Chen, 2004). Kushwaha (2010) indicated that companies could begin their green supply chain by purchasing products from green suppliers. Hervani et al (2005) claimed that GP is a part of GSCM. Nagel (2000) summarized that both GP and GSCM are the “green”-label application to supply chain while GSCM has higher sustainability level and influence in the supply chain. They all indicated that GP and GSCM have strong interaction, but no article was found to address this object. Hence, strengthening the relationship between GP and GSCM could be an efficient way to implement GSCM and accomplish the transition from green purchasing to green supply chain management especially in China.

1.2 PURPOSE

This paper aims at exploring and describing the development of GSCM in manufacturing industry in China based on the single-case study of Guitang Group. Here are two objectives to help reach the purpose.

i. What are the drivers and barriers for Green Supply Chain Management development in Guitang Group?

ii. How to strengthen the relationship between green purchasing and green supply chain management? In addition, we will give some suggestions for strengthening the relationship between GP and GSCM based on the analysis.

1.3 OUTLINE

In this thesis, there are seven sections. The first section contains the background and purpose for this thesis. The second section describes the used method in this thesis to show the whole process and the validity and reliability. The third section shows the literature review of involved theory about green purchasing and green supply chain management. Section 4 includes all the empirical findings of the case company Guitang, like introduction, background and green practices. In section 5, theory and findings are combining and compared in order to get results.
Section 6 is a summary for the above work and clearly presents the result for purpose. The last section is the reference list that contains comprehensive information of all the involved books, journals, internet and interview.
2. Methodology

The concept of green supply chain management was not well formed in the emerging markets and the limited study of the relationship between GP and GSCM just as mentioned in the preceding background becomes the main reason of this paper. In this paper, authors conduct a study based on a single case study—Guitang, China, which helps the researchers to study a detailed description of a phenomenon within its perspective (Yin, 2003). The single case study and all the related data collected from this case will be analyzed by the qualitative approach (Yin, 2011). As a secondary source of information, literatures has been searched mostly by the search engine of University of Gävle’s website with the key words as “green supply chain”, “China”, “green purchasing” and “manufacturing industry”. In this paper, deductive method is used and the conclusion should give the Chinese manufacturing companies some guidance to implement the GSCM and the awareness of the importance of Green Purchasing.

2.1 Case research strategy

Research strategy is a way to implement the research. There are several common research strategies like case study, ethnography, surveys, experimental research, historical research, action research, grounded theory and so on (Biggam, 2011). The research strategies that will be adopted in this thesis are case study and survey. A case study can helps the researchers to study the detailed description of a phenomenon within its perspective (Yin, 2003). It is a very popular strategy for students because it is easier for them to focus on one organization (Biggam, 2011). Survey is a selection from certain and representative type population that aims to producing statistics. The main method for collecting information of a survey is using questionnaires or interviews for selected people and then let their answers constitute the analyzed data (Fowler, 2001).
There are at least six different types of case study based on a 2 multiply 3 matrix. First, the case study should be identified as single- or multiple-case study based on the number of cases (Yin, 2011). Single case study is most useful in the early period of theory generation or later period of theory testing. Single cast study is often appropriate for three situations: it is a revelatory case, it is an extreme or unique case or it is a critical case in order to confirm, test or extend a theory (Yin, 1984). In this thesis, authors found a case study by Zhu (2004) which researched the integrating green supply chain management into an embryonic eco-industrial development of Guitang Group. However, it is almost ten years ago. The company has changed a lot. This thesis is a further and extended study of Zhu’s case study and focused on the relationship between green purchasing management and green supply chain management. On this basis, the case study should be identified as exploratory, descriptive or explanatory. The characteristics of these three kinds of case studies are “An exploratory case study is aimed at defining the questions and hypotheses of a subsequent study or at determining the feasibility of the desired research procedures. A descriptive case study presents a complete description of a phenomenon within its context. An explanatory case study presents data bearing on cause-effect relationships—explaining how events happened.” (Yin, 2003, p5) Hence, this case study is a single and descriptive case study. Questionnaire is better than interview for student to do a survey because of the time consumption (Biggam, 2011). Therefore, this survey is conducted by questionnaire.

2.2 Quantitative and Qualitative Methods

Both quantitative and qualitative researches have their own characteristics and cannot replace each other (Karlson, 2009; Biggam, 2011). Quantitative refers to the research that is concerned with quantities and measurements, the quantitative research always involves mathematical and statistical tools in order to analyze the simple quantitative information, which could be numbers, diagrams, statistics and tables (Biggam, 2011, Karlson, 2009; Walliman, 2005). This research method also adopts a deductive approach to figure out the “how” question (Biggam, 2011).
On the other hand, qualitative method is response to the “why” questions (Biggam, 2011), and it is more like a specific answer and related to in-depth exploratory. For example, the question could be “why….company could achieve the sustainable and profitable growth in last year?” This is more than a yes or no question or a numerical question. Van Maanen (1979) defined it as a collection of various tools “…which seek to describe, decode, translate and otherwise come to term with the meaning, not the frequency of certain more or less naturally occurring phenomena in the social word”(p.520). In this case, constructivism, interpretation and perception instead of quantities and measurements that stand for the rational and objective truth are concerned in the qualitative research (Karlson, 2009). What’s more, the qualitative research can provide a more in-depth understanding of the focusing question that perfectly matches the description function.

In this paper, both qualitative and quantitative methods are involved in order to get a general and deep understanding of GP AND GSCM. Qualitative research method is used to explaining and describing the relationship between GP and GSCM and the development of GSCM in emerging markets especially for the Chinese manufacturing industry based on the single case study in Guitang mainly through the interview. While quantitative research method involved in the survey targeted at 50 staffs in Guitang helps to figure out the drivers and barriers of implementation GSCM (Appendix II).

2.3 INDUCTIVE AND DEDUCTIVE APPROACH

Inductive reasoning and deductive reasoning are two ways to form knowledge in a scientific paper. Inductive approach is from individual and specialization to generalization to achieve the theory building process, which will conduct a construction based on all the current knowledge and previous studies (Hyde, 2000). It is more like a bottom–up analysis.

In contrast, deductive approach is an up-bottom analytical way, which always establishes the theory or generalization first, then uses the individual cases to prove it and it always related to
one or several hypotheses as the arguments to prove (Ali and Birley, 1999; Hyde, 2000). In most cases, deductive approach is together with the qualitative research with mostly untested theory. Henwood and Pidgeon (1993) indicate that the deductive perspective is closely related to “… an explanatory framework which assumes a realist ontology; that is that reality consists of a world of objectively defined facts” (p.15). Qualitative researcher could use both deductive and inductive method (Paton, 1991). The common situation is that qualitative method is used to describe the deductive research and the quantitative method is used to describe the inductive research. Keong and Yin (1997) described deductive method as “intellectualize relational databases by providing complex inference ability”, which indicate that deductive method could help user solve established problem with less time and efforts (Pon, 2003). One more thing, deductive approach could also avoid the disadvantages, which belong to inductive research such as the comprehensive need of theory and invalid data caused by the previous and old evidence. Based on above reasons, deductive approach is applied in this paper.

2.4 LITERATURE REVIEW

Literature review is a necessary part to construct the primary structure of knowledge and to show the previous studies and findings in our case field, which proves evidence and guidance for the paper work. What’s more, a deep and comprehensive literature review could also provide us a basic understanding and help us to find the gap in the theoretical literatures thus providing us valuable direction for further studying (Biggam, 2011). Once the main direction has been decided, the key words could be used for the selected search for the relevant articles by different search engines or libraries. In this case, Zhu (2004; 2007; 2010) has done several studies on green supply chain management with focus on the Chinese market that became the basic literature in this paper with the perfect match of the purposes. According to her papers, we target Guitang Group as our case study and form the content for the interviews. What is important that the model she came up with in 2004 for green supply chain management as our
main research objects (Zhu, 2004). One more thing, we developed a new model of Guitang based on this.

2.5 DATA COLLECTION

There are several data collection methods. Such as sampling, interviews, observation, secondary data and questionnaires (Biggam, 2011). In this thesis, the authors selected three persons of the case company to be interviewed. The interviewees include a manager of quality control and deputy director (Zhenjian Lou), a statistician and planner (Xiaoyan Huang), and a non-management employee (Jianjia Zhong). Then authors designed some questions and sent to them who we want to do the interview by e-mail. We gave them some days to prepare the answer. After that, we had a telephone interview with them due to the distance. Furthermore, Huang provided many internal documents about production process and environmental protection planning. We designed a questionnaire and then entrust Huang to send it to 50 persons and recovered 38 valid data. We recorded all the information they gave us. The question and survey we designed can be seen in Appendix II and Appendix III. According to the drivers and barriers selected from the literature for implementing GSCM which mentioned in Appendix I, in analysis part the first RQ is answered by summary of how many times appeared of each factors in Table 1 & Table 2. Authors use the appeared time for each category divide the total appeared time for all categories and then get the percentage to make the pie chart of drivers and barriers from GSCM from selected literature. Authors also use the percentage got in survey made the pie chart for drivers and barriers for Guitang. With the comparison between divers/barriers from selected literature and drivers/barriers in Guitang, the particularity of case could be figured out as well as the influence of China’s background. Based on the chart, the significance of each driver is different.

Secondary data is from someone else which present different views and other interpretations of the fact. There are several forms of secondary data like newspaper, published minutes, articles,
journals, books and other publications. It can help researchers to have more comprehensive understanding and appropriate data (Walliman, 2005). As secondary data, authors selected the relative articles and books from the internet and library. In order to understand the background and to obtain some supplementary information, authors visited the company’s official website (in Chinese) and translated useful information into English.

2.6 Validity & Reliability
Valid research focuses on how you collect and analyze the empirical data (Biggam, 2011). There are three main parts of testing validity, construct validity, internal validity and external validity. Internal validity pays attention to explanation and inference of research. External validity focuses on whether the results in a particularly set can be generalized to some broader theory (Yin, 2009). The chosen case company has many green innovation activities and it is a precursor in circular economy under the support from government. It does well in green purchasing and wants to implement GSCM in a good way. It is a typical case for green supply chain management in China. Hence, a lot of information is valid for other Chinese companies those have similar background. The authors designed some same questions for different interviewees in order to reflect the general viewpoint. Authors also designed some unique questions only for one interviewee in his/her own field in order to ensure the professionalism. The three interviewees come from different levels, top management, middle management and non-management. It can provide information that is more comprehensive. In addition, the questions sent in advance can let the interviewees have enough time to prepare data and clarify views. All the interviews are conducted in one week. Therefore, the information cannot change in such short period. Besides the information from interviews, there is other information from official website or internal files. This information is latest which can ensure the validity.

Reliable research requires that did indeed do the research, and pay attention on the record of evidence (Biggam, 2011). Reliability refers to different investigators do same case study in
order to reduce the bias and mistakes (Yin, 2009). Authors saved the e-mail and telephone recording and then repeatedly check the telephone recording and notes in order to ensure the correctness. Moreover, we also kept the contact details if there is a need to do more interviews. Besides, all the chosen literatures are scientific. Hence, the theory based on these scientific literature reviews is reliable.

2.7 LIMITATIONS AND POTENTIAL PROBLEM

Due to the distance and time limitation, we cannot do a visit for deep interview. The company is located Guangxi Zhuang autonomous region, south of China. The GDP from sugar and related industries occupies 50% of the overall GDP of the city. It may cause regional bias. In addition, as the company is a state-owned enterprise, it may get more government attention that other companies cannot get.

Because that the case study is a single case study, it has a certain degree of particularity. Although we have three interviewees from different level, only one person from one level. Hence, the information may be incomplete. The company only contains Chinese official webpage and all the interviews are in Chinese. Therefore, the translation of this kind of information may have some errors.
3. THEORETICAL FRAMEWORK

3.1 CIRCULAR ECONOMY

This concept derived from the industrial ecology model in German and Swedish environmental policy and formally accepted by Chinese government in 2002. It pursued as a development strategy to resolve the conflict between industrial development and environmental protection (Yuan et al., 2006). In essence, circular economy (CE) is a process where economic activities simulate the feedback mechanism of natural eco-systems. The core idea of circular economy is to let manufactured products or by-products to be used as resources for other industries (Geng and Doberstein, 2008). For China, circular economy not only aims at getting positive outcomes simultaneously in economy, society and environment but also tries to realize higher regional competitiveness and even pursue the equal distribution of economic growth and wealth (Geng et al., 2009). In recent years, there are many areas in China have already carried on circular economy and gained some progresses, such as Yunnan Erhai, Guangxi Guigang, Guangdong Nanhai, Inner Mongolian Baotou, Xinjiang Shihezi and Hunan Changsha (Li et al., 2011).

The circular economy model could be implemented at three levels, the eco-regions at the macro-level, the eco-industrial parks at the meso-level, and the eco-enterprises at the micro-level. At the enterprise level, reduction, reuse, and recycling of materials and energy, which called “3R” principle, is thought as the common approach for circular economy (IUCN, 1980; Yuan et al., 2006).

3.2 EMERGING MARKET

The general definition of emerging market (EM) is made by the World Bank, “a country is deemed ‘emerging’ if its per capita GDP falls below a certain hurdle that changes through time” (Bekaert and Harvey, 2002). Of course it is not the only definition of this term and they are been classified by different methodologies and granularity degrees (Kearney, 2012). And China has
been classified into the 13 ‘secondary’ emerging markets by the institution of Financial Times Stock Exchange (FTSE) which include Chile, China, Colombia, Egypt, India, Indonesia, Morocco, Pakistan, Peru, Philippines, Russia, Thailand and the United Arab Emirates (UAE). While the other 9 countries such as Argentina, Brazil and Czech Republic are categorized to ‘advanced’ emerging market with the most similar characteristics to developed market (Bekaert and Harvey, 2002; Kearney, 2012; Salomons and Grootveld, 2003).

Emerging market has different culture, language and politics and distributes in the different regions around the world which cover nearly 30 percent land mess with 80 percent population but only 25 percent global GDP made by them. This is why the topic of Emerging Market becomes such critical and hot for the researchers, and it also attracts much attention from the global institutions and governments (Kearney, 2012). The features of emerging market is also typical of their large volatility and dramatic current-account reversals by the less well-developed and uncompleted processes and systems of auditing, governance and in-efficient markets with less liquidity compared by the developed market (Aguiar and Gopinath, 2007; Bekaert and Harvey, 2002; Kearney, 2012; Salomons and Grootveld, 2003).

3.3 PURCHASING

Purchasing means the action of acquiring goods or services for some goals. The purchasing function for a company refers to the relevant activities that conduct the acquisition for any goals of the company. What’s more, Van Weele (2005) has a more comprehensive definition of purchasing as:

“The management of the company’s external resources in such a way that the supply of all goods, services, capabilities and knowledge which are necessary for running, maintaining and managing the company’s primary and support activities is secured under the most favorable conditions.” p.12
The strategic role and power of management of the department which conduct the purchasing function could have significant impact on the performance of purchasing, both general and environmental (Maria, 2011; Murray, 2000). Nowadays, purchasing becomes a buzzword which always be discussed with the supply chain. It seems to be more and strategic for the companies (Amelia and Larry, 1999; Antony et al., 2006; Evi et al., 2012). While the researches and arguments for the purchasing have last for decades, the role of it for companies has been overlooked and was blurry at the beginning. The history of purchasing has been through several evaluations that turn the role from reactive to proactive and with a long-term focus (Amelia and Larry, 1999). In Reck and Long’s (1988) purchasing model, there are four stages of purchasing development, from passive to independent and then going on to supportive with the future trend of integrative which means more strategic and centralized. In this article focus will mainly be the strategic purchasing with three characteristics’ strategic focus, strategic involvement and visibility of the relevant experts (Antony et al., 2006).

### 3.4 Supply Chain Management

A supply chain includes many entities such as suppliers, manufacturers, distributors, resellers, contractors, retailers and consumers. There are many different processes and activities among them like products, services and information (Croom et al., 2000). Supply chain management is a network to manage these businesses from original suppliers to the end user and the relationships from upstream to downstream. It can produce and add value for customers and other stakeholders (Lambert and Cooper, 2000). Successful supply chain management should do well in at least the following parts: planning and control, work and organization structure, product and information flows facility structure, management methods, power and leadership structure; risk and reward structure, and culture and attitude (Lambert and Cooper, 2000).
Efficient supply chain management can enhance competitive advantage and improve organizational performance because the competition is within the whole supply chain (Li et al., 2004).

People often confuse logistics and supply chain management. Logistics involves obtaining, producing, and distributing raw materials and products in the proper places and quantities. It is generally deemed to take place within one company. Supply chain management consists of customer order management, production processes logistical flows, and information flows. It needs control and monitoring in all the activities in the whole supply chain (Lummus et al., 2001).

3.5 Sustainable and “Green”

Sustainability has become the most popular topic in recent decades. It draws attentions from different parties in the society, and it will be more and more critical with the development of modernization. Different persons could have different understanding at this word, and the development of the concept of sustainable could be traced back to 1972 when the United Nations held the first conference related to internal environmental issues in Stockholm, Sweden and formed some basic principles and recommendations (UN, 1972). Then, in 1987 there is a general definition for sustainability development by the Word Commission on Environment and Development raised in the report of “our common future”, “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (p.54) (WCED, 1987). Later, another conference held in Rio de Janeiro emphasized the importance of sustainable in June 14, 1992 and submit as Agenda 21 (McDermott, 2009).

The word of sustainable in company strategies means more efficient, environmental friendly and long-term perspective with the balance of three dimensions of economic, environment and society (Costanze and Patten, 1995). It is also suitable for the company and means creating
values for shareholders without compromising the interests of stakeholders and environment (Giunipero et al., 2012). Although there are many organizations and parties working on this field and the public has generally recognized the importance of this concept, one of the most pivotal solutions has been regarded as the companies (Charter and Tischner, 2001). What’s more, “Green” is labeled in many specific words in the field of supply chain and purchasing from the literature, like green purchasing, green supply chain management, green manufacturing, green distribution (Hervani et al., 2005; Min and Galle, 2001; Lin et al, 2011).

China’s Sustainable development in emerging market (EM)

Nowadays, making a progress in sustainable development in emerging market is very urgent with primary priority of the global sustainable agenda (Eriksen and Watson, 2009; Delai and Takahashi, 2013; Papa and Gleason, 2012; Gentry, 2007; Anisfeld, 2007). Especially in China, the study shows that in 1996, less than one percent of GDP used in environmental related activities in China while the United States spends 2.5% and 5% for Australia at the same time (Chan, 2001). Facing by the consequent population pressure and environmental pressure come from the large scale of urbanization and dramatically increased economy, many of countries and cities in emerging market have been initialed the sustainable management.

In Agenda 21, there are special suggestions for Sustainable Construction in Developing Countries to provide guidance for sustainable development in emerging market (Plessis, 2007). As the response to this guidance and suggestions, several emerging market governments initialed the corresponding plans to help improve sustainable situations at local level (Plessis, 2007). China, the most typical country of emerging market, which has more emerging cities than other countries and incredible speed of economic growth, is also one of the first countries to implement sustainable development plan among emerging market in several cities (Plessis,
There are some typical problems happen in the way of sustainable development in emerging markets according to literature reviews (Delai and Takahashi, 2013; Papa and Gleason, 2012; Gentry, 2007; Bouton et al., 2012). Firstly, consumer awareness is a big problem through the implementing caused by the long term ignore of environmental and ecology part and no relevant complete educations have been received. Secondly, the green practices did not structured in a good way or integrated in a well-performed management system. Thirdly, mostly internal relationship focused while weak connection external in this field; fourthly, hard to do the innovation in sustainable development; finally, too much power from government. By the way, there is another challenge through the implementation of sustainable development in emerging market, Chan and Lau (2008) discussed that comparing to American market, Chinese consumers’ eco-purchasing activity do not mainly come from the environmental attitude but from the subjective norm.

However, dealing with the problems of sustainable development in emerging market, there are some suggestions introduced by Shannon et al. (2012): 1) adjustment of industrial structure related to land renewal, 2) plan for urban greening, 3) transparent “box” about standards and charges, 4) recycling in high level, 5) cross-department coordination.

3.6 GREEN PURCHASING

There are various definitions of Green Purchasing and it has been drawn more and more attentions to in recent years by the academic researchers and different parties in society. Carter (1998) gives a definition that green purchasing involves procurement function through different supply chain activities, like the LCA (life-cycle analysis) and the typical 3R—reduction, reuse and recycling which belong to product and process design part. The three-R principle is the most important function and approaches for the Green Purchasing (Carter, 1998). From the sustainable perspective, green purchasing is putting the “Green” concept into the purchase management and then promotes the environmental practice in company performance (Min and
Galle, 2001). Chen (2004) also indicates that green purchasing has beneficial influences in companies’ pollution control system and it could promote successful implementation of quality and environment standards in a company, such as ISO 14001 and EMAS.

Another critical finding in this field is that the cost of purchasing environmentally friendly materials is considered as the most important factor in the Green Supply Chain Management evaluation. It is always counted as most of the proportion of the total cost, which means Green Purchasing plays an irreplaceable role in a company’s GSCM activities (Zhou and Li, 2012; Lin et al, 2011)

### 3.6.1 Critical Issues

![Fig. 1 Critical Issues for Green Purchasing (Yen and Yen, 2012, p954)](image)

Yen and Yen (2012) list eight factors that have positive or negative impact on firms’ performance of Green Purchasing showed as above figure 1. According to their studies based on Taiwanese companies, there are two significant factors those reflect positive external and internal impacts—customer pressure and top management commitment (Giunipero et al., 2012). As for the customer pressure, it is derived by the interest and competitiveness that could obtain
from the “green”, like better reputation and broader customer base, which are driven by companies’ internal financial need (Yalabik and Fairchild, 2011; Chen, 2005).

Future more, the logistical and technological integration with suppliers are also the necessary conditions for a well-performance Green Purchasing strategy cause there will be a critical risk if the collaboration is weak between them (Zsidisin and Siferd, 2001).

3.6.2 THREE LEVELS OF GP ANALYSIS

![Three levels of Sustainable Purchasing analysis](Miemzcyk and Fohnsen, 2012, p480)

Miemzcyk and Fohnsen (2012) researched the different levels of analyzing the sustainable purchasing, supply management, and formed a basic structure of the three levels—dyadic (firm) relationship, supply chain and industrial network as showed above in figure 2. Most of the previous literature on sustainable purchasing is focusing on the firm level or dyadic level, which pay more attentions to the internal activities and processes (Li et al., 2011; Miemzcyk and Fohnsen, 2012; Min and Galle, 1997). The supplier relationship is simply from the supplier to customer in the upstream of the supply chain. The second supply chain level from Miemzcyk
and Fohnsen’s (2012) study is defined as including more than two supply chain actors (p483), which is directly related to the company such as direct supplier and direct customers. In this perspective, green purchasing could be regarded as part of green supply chain and the relationship could extend to both upstream and downstream of supply chain. Responsibility for sustainable purchasing is extending from inbound to every part of the product value chain. While the industrial network level should be a broader concept than the supply chain level, it includes all the direct and indirect actors in the whole operation (Miemczyk and Fohnsen, 2012).

Miemczyk and Fohnsen (2012) also illustrate the sustainable measures and strategies for the three levels in this research. From the broader level as network, the importance of Three-R principle is more notable, structural, deep to supply chain level, the cost management, monitoring, and risk managements start to be added to the strategies. When refining it to the firm level, more specify measures will be performed and conducted in order to ensure the sustainable development.

3.7 GREEN SUPPLY CHAIN MANAGEMENT

Compared with traditional supply chain management, green supply chain management (GSCM) adds more environmentally conscious mindset. It is the extension of the traditional supply chain that includes reducing products life cycle costs, reducing environmental impact, reuse, recycling and remanufacturing (Choudhary and Seth, 2011). It is also a practice of improving economic and environmental performance simultaneously by establishing close relationship with suppliers and customers in the whole supply chain management (Zhu et al., 2004). Narasimhan and Carter (1998) claim that green supply chain management includes the involvement of purchasing function activities such as reduction, recycling, reuse and the using of substitution materials. Hervani et al (2005) claim that Green Supply Chain Management (GSCM) consists of Green Purchasing, Green Manufacturing/Materials Management, Green Distribution/Marketing and
Reverse Logistics. According to these views, green purchasing is a particularly important part. It is a precondition for the next works.

Sarkis (2002) put forward that there are some important elements for decision construction of green supply chain management, such as the life cycle of products, the life cycle of operation, the measurements of organizational performance, and the business practices of environmentally conscious. Green supply chain management can be implemented as a win-win strategy that get profit and market share by minimizing waste and environmental impacts, while raising organizations’ ecological efficiency (Nilawan et al., 2010). However, it also makes supply chain design more complex and brings some operational considerations and strategic issues such as inventory planning, disassembly planning and scheduling (Choudhary and Seth, 2011).

3.7.1 Drivers
As for external pressure, because of the environmental pollution and the lack of resources, companies have to do some optimization of their supply chain management. There is much legislation, which requires companies to consider more about environmental protection (Kushwaha, 2010). The customers pay more and more attention on environmental issues. Most of them would pay more for environmentally friendly goods and want to know more environmental information of products (Lamming and Hampson, 1996). Especially in China, export and sales to foreign customers meet challenges because of the higher environmental standards. Under the circumstance, the government will exert pressure through legislation, regulation and tax policy (Zhu and Cote, 2004; Zhu et al., 2005). After joining the World Trade Organization (WTO), China attracted many foreign investments. But most joint ventures and foreign direct investment enterprises still purchase key materials and components from their own hometown due to that Chinese enterprises do not have abilities to provide materials and components that meet these foreign enterprises’ environmental requirements (Zhu and Geng, 2001). For internal awareness, companies can save costs and get more market share through
reducing the environmental impact of their business operation. Green supply chain management can help companies reduce waste, increase resources utilization and efficiently use equipment (Kushwaha, 2010). Kushwaha (2010) suggests that companies can develop new and innovative ways to enhance their competitiveness, for example, improving their environmental performance. Green supply chain management can help companies satisfy environmental regulations, reduce environmental impact of their production and service and respond customer environmental concerns. Thus, it can improve the competitiveness.

China as a major manufacturing country, has become more industrialized. It has many opportunities although potential opportunities exist, the emerging market also faces many challenges. Many multinational organizations and developed countries often regard China as a disposal point of end-of-life products. Zhu et al claim that (2005) it will cause greater environmental burden because China did not has suitable or enough infrastructure or tools to deal with those end-of-life products. Green supply chain management can help China and other developing countries mitigate environmental burden, proper handle both manufacture and disposal of products, and then potentially improve their economic positioning.

3.7.2 BARRIERS
Many articles indicate that economic factors and the related implementing expense and additional cost are the main barrier for companies implementing the green supply chain management as well as the green purchasing (Yen and Yen, 2012; Mathiyazhagan et al, 2013; Helen et al., 2008; Muduli et al., 2012). Lack of suitable guidance for environmental knowledge and training is regarded as another common risk that is related to the awareness of top management and stakeholders and efficient implementation and performance (Muduli et al., 2012). Muduli (2012) also claims that government plays an important role through the whole implementation and many countries exist in the situation where poor legislation hinders the success of implementation and evaluation especially in emerging market such as China. What’s
more, the power of public could be another hand pushing the sustainable development, so, the weak pressure from society may also lead to an insufficient implementation.

Giunipero et al. (2012) did a study of the different significant level of drivers and barriers for the implementation of SSM (sustainable supply management). In this study, initial buyer and supplier investment and economic uncertainty have been counted as the most important issue risking the implementing (Giunipero et al., 2012). It is easy to understand that high cost of the initial activities which has already been mentioned above come to the first position. While the economic uncertainty is the part that draws less attention, the companies will be affected by the economic conditions around and especially the uncertain economic times will make the green practice more risk (Jacobsen, 2002; Giunipero et al., 2012)

Mathiyazhagan et al. (2013) also do an interesting analysis focusing on SMEs. This is about the barriers of implementing green supply chain management. Some obstacles introduced in this paper are worth thinking and paying attention to—it is hard to see the benefit from the green supply chain management, lack of the information and expertise to guide the implementation, and the attitude related problems.

All the general drivers and barriers are summarized into charts, which could be seen in Appendix Ⅰ.

3.7.3 REVERSE LOGISTICS
Among all green activities, it is relatively easier to repair existing products and operate refurbishment. More and more enterprises pay attention on returns management or product recovery management. Hence, reverse logistic (RL) emerge as a relatively comprehensive ways to deal with backward flows (Fernandez and Kekale, 2005). Ronald and Dale (2002) put forward that reverse logistic is an opposite movement of materials and products in order to create or recapture additional value and proper disposal. It can be classified into four categories:
customer returns, retail customer returns, retail returns and manufacturer returns. There are some different destinations for returns, such as return to vendor, resell via outlet, donation to charity and disposal via recycling or landfill.

Reverse logistics aims at ensuring that materials and products can return from user to producer in order to be reused, recycled and reconditioned (Kushwaha, 2010). However, for most companies, they do not put reverse logistics into their planning strategies at the beginning. Nevertheless, they will take actions in order to response the requirements of customers or downstream channel members. The reverse logistics flow is more reactive rather than visibility (Ronald and Dale, 2002).

This model shows the materials flows in company that also consider the residual return. There are five detail ways for returns: recycle, cannibalize, remanufacture, refurbish and repair. These different methods not only bring the products with specified quality standards to customers but also represent a new source of demands are satisfied.
3.7.4 MODEL OF GSCM

![Diagram of Green Supply Chain Management](image)

This model is a general structure of implementing green supply chain management in an internal supply chain. It contains four main parts of GSCM: green inbound/purchasing, green manufacturing/production, green marketing/distribution and reverse logistics. Each part may input energy and output waste. It shows the interaction of each part.

Green Inbound/purchasing is the early part of the supply chain. The inbound from vendor includes raw and virgin material, new components and parts and reused and recycled material and parts. Then, all inbound will go to warehouse. Internal transportation, materials movement and inventory management should be considered as Green manufacturing/production that is the middle and complex part of the supply chain. It pays more attention on production operational performance. Fabrication and assembly are the main activities in this part. In order to get better, environmental performance, close-loop management, manufacturing management and source reduction should be considered in this part. Green marketing/distribution is the final part of the
supply chain. The final products will in storage and are distributed to other places. In this process, it involves location analysis, inventory management, warehouse management, packaging management and transportation management. Reverse logistics is a “closing the loop” of supply chain. Company can collect outbound, which can be reused, remanufactured and recycled, and then offer to vendor after treatment.

This model describes the implement of green supply chain management through the green purchasing, green production, green distribution, reverse logistics and go back to vendor for green purchasing. They connect each component and form a circulation in supply chain management.

Application Model of GSCM in Guitang Group

![Diagram of Application Model of GSCM in Guitang Group](attachment:image.png)

Fig. 5 Previous Application Model of GSCM in Guitang Group (Zhu and Cote, 2004, p1028)

Professors Qinghua Zhu and Raymond P. Cote introduced this model above in 2004 through analyzing the case of Guitang Group. This program was supported by a range of international organizations and research institutions, which is leading by the CIDA Tier 1 ECOPLAN China
Project (S-61562) (Zhu, 2004). This model is a detailed application of general GSCM model in Figure 5 in one of the Chinese manufacturing company and it shows the integrated and internal green supply chain of Guitang Group in 2004. The most outstanding feature of this model is that each residual product from up-stream plant can be used as raw materials for down-stream plant. For example, it uses the molasses that generated from sugar production to produce alcohol. Then, put the residual products into fertilizer production. Finally, provides compound fertilizer as the output to customers.

There are two main approaches for greening the supply chain. The first approach is taking full advantages of raw materials, co-products, by-products and residual products. The core idea of this approach is that all waste output should be understood as raw materials with value. The second approach is reducing the residual products and emission. The core idea of this approach is cleaner production. Water is the main energy for Guitang. Hence, it commits to improve water efficiency and reduce the wastewater. The wastewater treatment method of Guitang is also take advantage of residual products. It filters wastewater by using the boiler slag.

3.8 PREVIOUS STUDIES ON RELATIONSHIP BETWEEN GP & GSCM

As mentioned in the introduction, the major shortage of articles and information related to the relationship between green purchasing and green supply chain management becomes one of the main drivers of this thesis. In spite of this, some relevant articles still could be found.

Nagel (2000) discussed this topic in the electronics industry. Author used the original equipment manufacturer (OEM) as the experimental target and analyzed both green purchasing and green supply chain management approaches to integrate the environmental management control. Through describing, analyzing and comparing the respectively characteristics and results, Nagel draws the conclusion from the business and leadership perspective. There are some results from the comparison between the two approaches: green purchasing is more
action-driven program while GSCM is more strategic; GP is more re-active and GSCM is pro-active; GSCM is more depend on the whole vision and leadership with longer perspective; GP trigger less innovations compared to GSCM; and the GSCM spreads the green conscious from top-down pattern, while GP creates awareness from bottom up. Based on these result, he summarized the conclusion that both GP and GSCM are the green-labeled application of supply chain; however, GSCM has higher sustainability level and influence in the supply chain.

Later, Zhang (2001) based on the study of Nagel (2010), did a further study related to the environmental consciousness in supply chain. In this article, the role of procurement in environmental management was also highlighted. It related to the cost accounting of the whole production life, eco-design connected to end-of–product management, the supplier’s environmental qualification, supplier selection for actual purchasing, the packaging and logistics activities, waste management and three-R approaches, which closely related to the whole life cycle of a product.

Japanese professor Sato claims the relationship between GP and GSCM as “Green purchasing is the most effective driving force for businesses to promote the development of environmentally conscious products and services and to make green supply chain” (SATO, 2002, page). In this article, GP as the effective market-oriented tool from the demand perspective could have strong positive impact on the environmental conscious building and the greening of supply chain, which means that GP is the extremely important initially for implementing the GSCM. Based on these views, he emphasized the necessities and significance of the global development of GP and the Green Purchasing Network (GPN) especially in Asian where most emerging markets are.

In addition, many of articles mentioned the GP as the irreplaceable part and initiatives activities in GSCM (Hervani et al., 2005, Jabbour et al., 2013; Zhu et al., 2008; Zhu et al., 2007 Dheeraj
and Vlshal, 2012; Srivastava, 2007). Zhu et al. (2007) even either claim that depending on different boundaries pushed by the goal of the researchers, GSCM could be the purchasing stage or expand to larger level. The GP forms the GSCM in mainly two way, first is the equation introduced by the Hervani et al. (2005) that GSCM = GP + GM + GD + RL and the second is illustrated by Zhu et al. (2007) that five factors of measurement formed GSCM—internal environmental management (IEM), GP, cooperation with customers, eco-design, investment recovery. Additionally, the relationship between GP and GSCM could also be indicated from the influence they have on each other. How much money is spend on environmental materials purchasing is the most critical issue for GSCM performance and takes the largest proportion of all the green expenditure (Zhou and Li, 2012; Lin et al., 2011).

Over all, the comprehensive review of the relationship between GP and GSCM is stated in the Appendix IV, where all the relevant articles and remarks of each one are cited.
4. EMPIRICAL FINDINGS

4.1 COMPANY PROFILE

Guitang Group was completed and put into operation in 1956. Guitang Group conducted and completed the shareholding system reform in 1993 and its stocks market was listed on the Shenzhen Stock Exchange in 1998. Now the stronghold of Guitang Group is still rooted in Guangxi province. The whole company covers an area of 1.5 square kilometers and the ultimate controlling party of Guitang is the National Resources Committee of Gangxi Province. The group has more than 3,000 employees and more than 500 professional and technical staffs in all kinds of field. It is the largest sugar refinery in China. This company mainly has six core factories or subsidiaries: a sugar factory, a cultural paper mill, a household paper mill, a pulp mill, a thermal power plant and a light industry machinery factory. The annul total production includes sugar (150,000 tons), processed raw sugar (300,000 tons), machine-made paper (150,000 tons), bagasse eucalyptus raw pulp (150,000 tons), alcohol (10,000 tons), precipitated calcium carbonate (30,000 tons), recovery of caustic alkali (35,000 tons) and compound fertilizer (30,000 tons). The products of Guitang get quality, customer satisfied and sales volume award for many years (Guitang, 2013).

4.1.1 SUSTAINABLE DEVELOPMENT IN GUITANG GROUP

Guitang Group concerns about sustainable development from a very early time, after reorganization from Guangxi Guigang Sugarcanes Chemical Plant to Guangxi Guitang (Group) co., LTD in 1956, sustainability became the core competitiveness for Guitang. From that time on, Guitang had become one of the key construction projects during the First Five-year Plan of China. Then Guitang implemented as one of the first core batch of pilot projects named “National Eco-Industrial (sugar) building demonstration zone - Guigang” which also called as NPEIPP program as mentioned above, and this program had been initiated and supported by the
government in 2001. This is the first eco-industrial park construction planning led by a large enterprise in China. Guitang achieved the transformation of industrial pollution prevention and management from the end of the treatment to the whole production process management. Through years of development, Guitang formed the embryonic form of the sugar circular economy. It includes sugar, paper, alcohol and precipitated calcium carbonate. The bagasse, molasses and filter mud waste from sugar production achieved full recycling after treatment. Hence, the production waste utilization rate achieved 100%. The output value of comprehensive utilization products has greatly exceeded the main products, sucrose. Guitang has a number of environmental protection independent intellectual property rights. It is in the domestic leading level. It has won many honorary titles on national, provincial and ministerial level such as “National Advanced Enterprises of Resource comprehensive utilization”, “National Advanced Enterprise of Environmental protection” and “National Excellence Award of Enterprise management”.

In recent years, Guitang pays more attention to cleaner production. It puts a large number of special funds into environmental protection activities and utilizes new environmental technologies, new crafts and new equipment. It uses high technology and advanced applicable technologies to transform traditional industries in order to continuously enhance the ability of efficiently use of resources and environmental protection. One more things, another highlight of Guitang is the department of R&D. Guitang owns its own enterprise technology center and post-doctoral scientific research workstation that is devoted to innovation related to sustainability. The comprehensive management focus is on the reduction of sewage, industrial wastewater recycling, and flue gas desulfurization and so on. “Turning wastes into treasure, saving energy, promoting cleaner production and building a circular economy” has become the main theme of Guitang Group (Guitang, 2013).
4.2 Drivers and Barriers of Implementing GSCM for Guitang

4.2.1 The Results of Questionnaires

Here is a questionnaire for survey. The point from 0 to 5 is stand for the significance of each factor. 5 means extremely important while 0 means no influence. The respondents can mark in each category of drivers and barriers. They also can also add some others drivers/barriers in this chart. Authors send this questionnaire to 50 staffs and get 38 valid feedbacks. Then, authors calculated the average point of each category and the total score and got percentage by using average point divide total score. The result of the survey has been summarized, compiled and analyzed. The average point shows the significant level. For example, 5 is vital significant, 4 is significant and 3 is medium. The categories and significance level of each category shows in table below:

**Table 1: Significance of Drivers for GSCM in Guitang**

<table>
<thead>
<tr>
<th>Categories</th>
<th>Environmental</th>
<th>Government</th>
<th>Customer Pressure</th>
<th>International</th>
<th>Resource Utilization</th>
<th>Competitiveness</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Significance Level</td>
<td>Little</td>
<td>Vital</td>
<td>Significant</td>
<td>Medium</td>
<td>Vital</td>
<td>Medium</td>
<td>Little</td>
</tr>
<tr>
<td>Percentage</td>
<td>8.3</td>
<td>21</td>
<td>16</td>
<td>12.5</td>
<td>21</td>
<td>12.5</td>
<td>8.3</td>
</tr>
</tbody>
</table>

*Environmental pressure*

Due to the environmental pollution and the lack of resources, government focuses on environmental protection and sustainable development. Chinese government often pays more attention on large enterprises because they will cause greater impact on environment. The Guangzhou government invests in local industry to build an industry ecology park that let Guitang Group as
the leading. Government also introduce tax cuts for environment-friendly products such as the organic fertilizer which is produced by alcohol residual and the paper which is produced by content of bagasse more than seventy percent.

**Customer pressure & competitiveness**

The main customers of Guitang are international large enterprises like Wal-Mart, Nestle, Mead Johnson and Coca-cola. They have many strict requirements of Guitang’s products. The products not only need to have good quality but need also to be environment-friendly. With the development of environmental protection, environment-friendly products will better meet the satisfaction of customers.

**Increase resource utilization**

Sugarcane as a kind of tropical crop, only has a very short harvest period. The sugar production only can be conducted in sugarcane harvest period because that the main raw material is sugarcane. It means that if the sugar refineries only operate sugar production, the machines and employees will be idle. It is very difficult for them to survive in such situation let alone get profit.

**Corporate image**

Guitang Group is a state-owned enterprise and a leading enterprise in Guigang and even in sugar industry. A good corporate image not only can attract more customers and occupy more market shares but also can as a good example for other enterprises. Particularly, the local government gives a lot of support to Guitang Group in both policy and capital.
There are seven categories of barriers in Guitang—investment, sustainable guidance, top management commitment, legislation, society, economic uncertainty and attitude. Besides the general seven categories, some results of questionnaire show another barrier may exist in the Guitang’s case, which are regional single culture and environment influence. They just be raised in several questionnaires, so did not count into the table. While, they have some special formative factors which related to the specific background and environment of Guitang.

**TABLE 4: SIGNIFICANCE OF BARRIERS FOR GSCM IN GUITANG**

<table>
<thead>
<tr>
<th>Categories</th>
<th>Investment</th>
<th>Sustainable Guidance</th>
<th>Top management commitment</th>
<th>legislation</th>
<th>Society</th>
<th>Economic uncertainty</th>
<th>Attitude</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average</strong></td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td><strong>Significance Level</strong></td>
<td>Little</td>
<td>Medium</td>
<td>Little</td>
<td>No</td>
<td>Medium</td>
<td>Little</td>
<td>Vital</td>
</tr>
<tr>
<td></td>
<td>weak</td>
<td>weak</td>
<td>weak</td>
<td>weak</td>
<td>weak</td>
<td>significant</td>
<td></td>
</tr>
<tr>
<td><strong>Percentage</strong></td>
<td>11.7</td>
<td>17.6</td>
<td>11.7</td>
<td>0</td>
<td>17.6</td>
<td>11.7</td>
<td>29.4</td>
</tr>
</tbody>
</table>

*Initial investment*

Although the economic factor is the most common and critical barriers for the implementation of GSCM, it is different situation in this case and the economic factor seems not such significant as mentioned in theory at the beginning because of positive policies and support foundations from government. Nevertheless, under the trend of state-owned business turning to more and more marketization and privatization in China, profitability is particularly important and related to the survival of company itself. While the changing of equipment to be more efficient and green will cost a large amount of money, for example, according to interview, last year Guitang
had changed a batch of equipment worth 50 million, and last season, the net margin still minus 20 million. It could hinder the implementation process.

**Lack of sustainable guidance**

In that time, GSCM is not familiar to see in the Chinese companies, and the concepts in this field still not well formed not to mention the technology support and related innovations. Combined with few professionals working in sustainable, make GSCM harder to success. However, National policy and local government support and protection policies make it easier to deal with. Nowadays Guitang even has its own enterprise technology center and post-doctoral scientific research workstation while there has another problems, many technical person quit the job and find another way to living. The person issue could be more serious than initial stage of Guitang, and low retention rate of professors could be a potential threat to the further development of Guitang.

**Attitudes**

Guitang Group builds its own community and schools called Guitang Migrant Children School to form harmonious living conditions. While after the conversations between some of the students from this school, the attitudes towards Guitang are not consistent and many of them did not chose Guitang as their carriers and do not know much about the GSCM in Guitang. However, most of them have both parents working in product line of Guitang.

**Regional single culture**

In the Guitang’s case, due to the supplier is directly from the local farmer of sugarcane, and this activity promotes the local economic development. Guitang become the pillar industry in the local region. With the success of the implementation of GSCM, the demand of sugarcane dramatically increases thus most of farmers around the companies turn to grow sugarcane. This
phenomenon could be regarded as the special feature of this area, while it also leads to a regional monoculture which easily effected by the economy uncertainty.

**Environment influence**

Due to different drivers, low interest loans, low tax from government and technology support from Guitang, the volume of sugarcane production raised rapidly. A large area of sugarcane will contribute to critical environmental problems and harms the soil and biodiversity from the ecological perspective. Such unreasonable intensity of agriculture production could lead to land desertification, loss of soil and water and soil pollution, which will damage the regional environment and sustainable development.

**4.3 Green purchasing strategy of Guitang**

Sugarcane is the main raw material of Guitang’s production. Productions’ quality highly depends on the quality of sugarcane. Higher quality sugarcane can produce large volume, high-quality sugar and higher quality residual products. Coal is the main fuel in order to provide energy in production process. Sugarcane and coal plays an important role in the whole supply chain, as the main inbound material.

**Resource changes and control**

Under the circumstances, to guarantee the quality and sustainability of purchasing is the top task for the Guitang Group. As most of the suppliers are local farmers, it is easy to build relationship with them and thus achieve the control of sugarcane. As the main fuel of production, the quality of coal is also vital. The quality of coal directly affects the emission to air. Monitoring their main raw materials and ensuring the green from the start of value chain is very important. For instance, Guitang will evaluate the performance of sugarcane yield per acre and the sugar content before purchasing. Guitang has a farming department to provide some guidance for farmers in order to ensure the sustainable providing. For example, conserve the sugarcane
species and organize the transportation. Furthermore, Guitang is located on the seaside. Hence, it uses seawater by desalinating as a part of their industrial water.

Integration with suppliers

Guitang has a very close relationship with its supplier, farmers. It is worth mentioning that Guitang not only buy sugarcane from farmers but also sell back to farmers with the fertilizer which is a residual product. Guitang are trying to have a further relationship with its supplier----farmers by offering seventy percent discount to these farmers. The fertilizer is organic, so it also improves the quality of sugarcane. Planning cultivated land and providing technology support related to sustainability and greening for the farmers are the tools for logistical and technological integration with suppliers. Guitang sends professionals to instruct farmers in sugarcane plantation, which includes planting new varieties of sugarcane, helping them to irrigate in dry season and reasonably arrange the cut and transport frequency. In addition, Guitang help them construct roads, deal with natural disasters and offer pumps and some other equipment as well. Guitang has rational raw materials purchasing plans according to its production capacity and expected sales. Since its main material is sugarcane, it has a good warehouse management to prevent the damage of sugarcane. Seawater desalination is also reducing the directly using of the city water. Guitang also have many energy conservation projects like technological transformations and energy system optimizations of industrial boilers, industrial furnaces and motor system.

Reuse and recycle

Guitang does well in the reuse and recycle. There are plenty of green practices involving reuse and recycle in Guitang. Using molasses to produce alcohol and using bagasses to produce pulp are the main reuse practices. It also expands the production line. There are three main recycling lines in production process. The first is using the residues from alcohol plant and filter mud
from paper mill to produce fertilizer and selling back to farmers. The second is using the biogas from sewage treatment pool to thermal power plant in order to provide energy. The third is using the white water and alkali from pulp plant back to pulp plant. Guitang saved a large part of procurement by transforming the residual product into raw materials.

4.4 GSCM in Guitang

Based on the various green purchasing activities and strategies above, Guitang has formed a more comprehensive and mature GSCM system in recent years. Furthermore, a diversification of production culture is been the significant label and feature of Guitang now.

At the very beginning, the low utilization of equipment and accompanying financial situation hindered the development of Guitang. Then, the reusing of waste materials, internal recycling and external loop called circular economy started to change the company’s own financial problem. However, with the elevation of company profits, environmental conditions in and around the company have be improved contemporary. For a long period, people working in Guitang are familiar and pride with their circular economy and green purchasing development as the two main structures to perform the green practices. Until 2004, according to Professor Zhu Qinghua’s study of green supply chain management of Guitang, the concept of GSCM after hidden for a long-time finally has finally been formally brought up. During the interview, the manager has a very good understanding of company’s GSCM strategies and performance as well as green purchasing, and from the various documents offered by them, the top management highly support this management system and makes a consist commitment. Nevertheless, on worker level, which is the normal staff in generator room, some even have no idea of what is GSCM, but they do have understanding of green purchasing, and believe that most of the green practices and whole green thing is depending on green purchasing to a large extend. It is oblivious to find that GSCM concept still not popularized around the company now, however, they did a great job in this field.
Except for the good knowing, GSCM has been improved and perfected all the time by new strategies, adjustment of product structure and updating equipment. Now, the system is performed well based on Zhu’s (2004) model and the information of main product lines and layout of whole manufacture factory, here is the updated and newest model of GSCM in Guitang:

Fig. 6 Application Model of GSCM in Guitang Group today

There are five production lines in Guitang Group like the black line shows and the green line means main output products. The first one is feeding sugarcane into sugar factory and directly producing sugar. The second one is using the molasses from sugar factory to producing alcohol. The third one is using the bagasse from sugar factory to produce pulp and using the pulp to produce cultural paper and household paper. The forth one is using the residual product from alcohol plant and the filter mud to produce fertilizer. The last one is using the filter mud from
paper mill to produce alkali and precipitated calcium carbonate. As the products, the sugar, alcohol, cultural paper and household paper are sold to customers. The fertilizer is offered back to suppliers. The alkali and precipitated calcium carbonate are put back in production.

According to the three key conversions, fertilizer workshop, alkali workshop and sewage treatment pool, Guitang has three main recycle lines in production process which are indicated by the red line. The first recycling is as the centre of fertilizer workshop. It is using the molasses that generated from sugar production to produce alcohol. Then, put the alcohol residual products and the filter mud from paper mill into fertilizer production. Finally, provides organic fertilizer as the output to customer that is the farmer, the second recycling is the center of alkali workshop. It is using the bagasse from sugar production to produce pulp at the beginning. Then, it is using pulp to make paper. In this process, it will generate filter mud. Putting it into alkali workshop, it can output alkali and precipitated calcium carbonate. The recovery alkali can be reused in papermaking. The third recycling is the center of sewage treatment pool. All the wastewater from productions is deal with in sewage treatment pool. Boiler slag from boiler in thermal power plant can be used to filter the wastewater. Then biogas will be generated in this process and it can be put back in thermal power plant to providing energy. Another typical reuse line in this case is for the water. The white water from paper mill will be handled and used in pulp production. These three close-loops achieved a good recycling.

These reuse and recycle practices form a comprehensive and mature product network. It promotes the implementation of green supply chain management. In addition to reusing and recycling, cleaner production is also a core idea of green supply chain management in Guitang Group. Energy conservation and emission reduction is the keynote for Guitang’s cleaner production. For example, it has technological transformation projects of flue gas desulfurization, complex drying process for coal-dressing and dry dusting. It invests a lot of money on regular equipment update and can get return in several years. Guitang often uses
pipes and conveyor belt to transport materials and products in each plants and workshops. It reduces the fuel of transportation. Guitang also trains its staffs and tries to improve their awareness of green production and sustainable development. All these green practices help Guitang achieved 80%-90% of the materials utilization and almost non-compliant wastewater and exhaust emissions.

4.5 **EXTERNAL RELATIONSHIP**

As the relationship with upstream of supply chain, mainly the sugarcane growers which apply the main raw materials to Guitang and the coal suppliers which offer the main energy for the whole factory, it has been discussed above as a strategy of green purchasing. Guitang group closely communicate with the big sugarcane growers with long-term relationship and make contracts with them, as for the sugar cane planting on a smaller scale, Guitang Group actively planning the grown plants for them. The better news for farmers is that they also provide all aspects of the technical support and counseling, and a developed new sugarcane varieties are provided to sugar cane. What’s more, Guitang helps them to build roads thus letting the logistics become more convenient, efficient and green. Not only such, Guitang use the recycling filer mud and alcohol to made into green organic fertilizer with seventy percent discount even free feedback gives to all sugar cane farmers to help improving crop quality while maintaining their core raw materials of good quality. For the supply of coal, Guitang also has several stable big suppliers, and Guitang annually invite tenders from these suppliers. The decision depends on factors of price, quality, and sulphur content such economic, quality and environmental indicators in order to raise the level of green to the maximum extend without damage the profits. Guitang sets a clearly standards for different suppliers and give opportunities to those who do relatively better in environmental protecting. In this way, most of the suppliers that have close relationships with Guitang as well as the farmers improve their standard of green according to the cooperation with Guitang.
In the downstream of supply chain of Guitang, one big part are the directly consumers of sugar and papers, of which the most important is the large international companies like Wal-Mart, Coca-Cola, Pepsi-cola and so on. Keeping long-term relationship with those key customers is the first target in relationship management with customers for Guitang. All these companies have quite high standards for the quality and well as the green performance in Guitang, and the work situation. To ensure the justice they always let the third party to do the strict examine at regular intervals. To meet the high standard and reply to the extensive customer pressure for green, Guitang has to improve their sustainable management especially on the environmental part. In fact, based on the interview, most of them point out that thanks to the distinctive competitiveness in the “green” part, Guitang Company could stand out in a crowd, become the leading company in this field.

4.6 RELATIONSHIP BETWEEN GP AND GSCM

As mentioned above, managers’ level holds a more comprehensive perspective and they think green purchasing is the biggest and the most important part of green supply chain management that accounts for the largest proportion of cost. While, there are no clear boundaries between them, and even no official documents to implement. However, on the performance level, most of the non-management level is not familiar with the concept of Green supply chain management. They just know some relevant green practice and have certain knowledge of green purchasing. When explaining the meaning of green supply chain management to them, they could only match it to green purchasing and stacks of documents related to environmental protection and resource conservation.
5. **ANALYSIS & DISCUSSION**

5.1 **DRIVERS FOR IMPLEMENTING GSCM IN EMERGING MARKET**

![Drivers from selected literature](image)

*Fig. 7 Drivers for GSCM from selected literature*

From the Appendix I, Table 1, Figure 7 summarized the barriers of implementation the GSCM that found in the literature review part (Kushwaha, 2010; Lamming & Hampson, 1996; Zhu et al., 2005; Zhu & Geng, 2001; Zhu & Cote, 2004)

![Drivers for Guitang](image)

*Fig. 8 Drivers for GSCM in Guitang’s case*
The pie chart (Fig.8) above shows the proportion of different drivers in Guitang Group according to the importance in questionnaires of survey.

According to the contrast between drivers from selected literature and drivers from Guitang, there are some obvious differences. The government policy, environmental pressure and customer pressure are top-three drivers from selected literature. While, in Guitang’s case government policy, customer pressure and increase resources utilization are top-three drivers.

Compare with selected literature, significance of government policy is a main driver too. In recent years, governments pay a lot of attention to sustainable development. Hence, they may introduce much legislation and regulation to let companies not only focus on economic benefits but also on environment performance. However, governments often exert pressure on companies. If the companies cannot meet the environmental standards, they may be punished or maybe disqualified of operation (Kushwaha, 2010). However, Guitang Group is a state-owned enterprise. The government, especially local government plan to develop it as a leading enterprise in Guigang City and in sugar industry. The development process and result of Guitang will be an example. The eco-industrial parks as the meso-level of circular economy can help Guigang City realize higher regional competitiveness and get the equal distribution of economic growth and environmental protection. Hence, local governments invest a lot in Guitang and try to develop it as a centre of Eco-industrial Park. As a Chinese company, government has much power. Therefore, Guitang has relatively enough money and technology to implement GSCM.

Customer pressure is a main driver for Guitang as well as in selected literature. This kind of pressure is main come from its multinational corporation like Wal-Mart, Nestle, Mead Johnson and Coca-cola. They have many strict requirements of Guitang’s products. The products not only need to have good quality but need also to be environment-friendly. With the development
of environmental protection, environment-friendly products will better meet the satisfaction of customers (Lamming and Hampson, 1996).

Different from the selected literature, increasing the resources utilization is a main driver for Guitang. If the sugar refineries just use sugarcane to producing sugar, it can only operate several months because of the quarter of sugarcane. Due to the industry characteristics, it has to increase the utilization of resources and equipment in order to let companies can operate in a long period. 3R principles that contains reduce, reuse and recycle can help company achieve lower consumption, lower emissions and higher efficiency. Green supply chain management can help companies reduce waste, increase resources utilization and efficiently use equipment (Kushwaha, 2010)

Guitang’s main products are sugar, paper and alcohol. Therefore, there are emissions to air and water. The lack of resources is mainly due to the coal and water that are the main resources to supporting energy. Hence, Guitang has to pay attention on selecting coal and cleaning the emission to air and water. However, compared with other manufacturing companies in China, the emission from Guitang and the lack of coal and water are not so serious. Thus, environmental pollution and lack of resources is not a main driver for Guitang.
5.2 Barriers for Implementing GSCM in Emerging Market

From the Appendix I, Table 2, Fig. 9 summarized the barriers of implementation the GSCM that found in the literature review part (Yen & Yen, 2012; Mathiyazhagan et al., 2013; Helen et al., 2008; Muduli, 2012; Giunipero et al., 2012; Jacobsen, 2012).

The pie chart (Fig. 10) above shows the proportion of different barriers in Guitang Group according to the importance in questionnaires of survey.
According to the figure 9 of barriers from selected literature and barriers from Guitang, initial investment is the biggest barrier from selected literature followed by lack of sustainable guidance and poor legislation. While it is different in Guitang’s case, attitude is the first barriers followed by the weak pressure from society and lack of sustainable guidance.

Based on the results from the survey, it’s obvious to notice that the high initial investment both from stakeholders, suppliers and customers rank the first place as the most influential factor. This result consists with the study conducted by Giunipero et al. (2012), which emphasize the importance of initial investment generally. It is without doubt that economic factor is one of the most critical issue when implement new approaches or systems. While in the case of Guitang, this factor only average count for three points of significance compared to the maximum five points in the initial stage of implementing GSCM. It is interesting to find that in the Guitang’s case, initial investment is not such critical as general and this was largely due to the government’s vigorous support, such as pilot project of green environmental protection, financial and technology support, and low interest loan for sugarcane farmers that supply sugarcane to Guitang as mentioned in finding part. This reflects the characteristics of China market that is government power play a key role in the innovation and change. Under the background of China market, government should be the driver for sustainable activities by providing particular supports for such pioneer companies who implement green supply chain management.

There are two factors show a big difference from the comparison—weak society pressure and traditional attitude. Pressures from society has a positive impact on the implementing of GSCM, while lack of society pressure could hinder the way of GSCM development, but it is not so significant from the low frequency mentioned in articles. Nevertheless, it gets relatively high points in the survey. As well as the traditional attitude factor, it takes much higher proposition in Guitang’s case rather than general, and this could tell about the attitude among on line
workers. This is caused by a rooted problem of China that the awareness of environmental of public and staffs is low (Delai & Takahashi, 2013; Papa & Gleason, 2012; Gentry, 2007; Bouton et al., 2012). The attitude as one of the main barriers reflects the negative side when facing to the innovation or changes. Even with the leading of government, the attitude could not completely change especially in performance level that is the actual behavior of the activities. Especially for consumers in emerging market, their eco-purchasing activity is depends less on their sustainable attitude than subjective norm (Chan and Lau, 2008). As for staffs, they do not have a comprehensive understanding and truly accept this concept, so, it is harder to performance well in this field. As for the poor legislation, it may not hinder the implementation of GSCM so much in Guitang’s case as from the literature. Policies from government in China are more like drivers to implement GSCM.

Other aspects mostly agreed with each other in these two figures except for the two special barriers in Guitang’s case. Single regional culture and environmental problems could caused by too much “intervention” from government, thus result in the rise of cane sugar mill as well as consequent large-scale planting of sugar with more and more farmers. Although these factors do not have significant impacts initial according to the interviews, they could become to the potential risks for the further development of GSCM in Guitang.

From an overall perspective of concept, all the differences between the barriers of implementing GSCM from selected literature and the Guitang’s case is more or less related to the irreplaceable role of government and the social recognition of sustainable and green. Guitang Group has a high degree of representativeness of China because of the typical background of Guitang Group. To sum up, the barriers of implementation green supply chain management in Chinese markets based on Guitang Company are mainly attitude, weak society pressure and lack of the sustainable guidance according to the features of Guitang and Chinese markets.
5.3 Strengthen the Relationship Between GP and GSCM

According to the GSCM definition given by Hervani et al. (2005), Green supply chain management is a sum of the green purchasing, green manufacturing, green distribution and reverse logistics. The relationship is claimed as the include-relationship, which also discussed in many other articles. They could closely relate to environmental collaboration in different scope. Based on the interview of Guitang, the GSCM and GP did not connect well mainly due to the lack of sustainable awareness. While, strengthen the relationship between the GP and GSCM will further improve the GSCM performance. Based on the combination and comparison of literature and findings, and considering to first research question result here are some factors and aspects that could enhance the relationship and improve the performance of sustainable management in company.

According to the cross-comparison of result from first research question and the literature of GP’s critical issues, there are four factors which could have significant impact on the relationship between GP and GSCM—government policy, customer pressure, integration with suppliers, top management commitment.

Government policy

Due to the environmental pollution and lack of resources, companies have to do some green practices like GP and GSCM to reduce the emission and increase the resource utilization. Government power play a decision-making role, it is critical to get help from government for implementation the GSCM. As mentioned in theory, regulatory pressure is also a critical issue for GP. The challenges that exist in GP implementation are lack of investment, lack of trust and uncertainty result. However, in this case, government could act as the role of sponsor, supervisor and offer the basic trust for suppliers and producers. Once companies have to worry less about costs, they will more willing to take some green practices from GP to GSCM. Government role is especially vital in Guitang case. In order to construct Eco-industrial Park in
Guigang City, government pays much attention on sustainable development of Guitang Group. Government introduces tax policy and program to promote the relationship between sugarcane farmers and Guitang to let it achieve green purchasing and sent experts to help Guitang to build GSCM like the previous study by Zhu and Cote in 2004. If company could get support from government or there is any positive policy for their implementation of GSCM, which can cause significant impact on the performance of GP, it may directly influence the purchasing behavior and requirement for company. Thereby, government and environment pressure can let company do more improvement of both GP and GSCM and strengthen the joint between them.

Customer pressure

Customer pressure is a main driver for GSCM and promotes the GP development because the interest and competitiveness could be obtained from the “green”. As said earlier, customers pay more and more attention to environmentally friendly products and want to know the environmental information of products (Lamming and Hampson, 1996). Hence, the green level for raw materials can directly affect the publicly available information to the customer and subsequent production. Green purchasing is a better way to ensure the green level for raw materials. Higher GP level can lead to a higher GSCM level. Like Guitang case, its main customers are international enterprises such as Coca-cola and Wal-Mart. Hence, they have very strict standards of products and even the whole development of the company. In order to satisfy them, Guitang has to buy higher quality raw materials and do well in production. Meanwhile, continuous development of GP and GSCM help Guitang get better competitiveness. Most of their customers only buy products from Guitang. However, for some other Chinese companies, customer pressure may not play such important role caused by the long-term ignorance of environment and ecology (Delai & Takahashi, 2013; Bouton et al., 2012; Chan and Lau, 2008). Guitang can attract customers to pay attention to its GP and GSCM development partly because it is a large state-owned enterprise. Hence, customer pressure and competitiveness can let
companies not only pay attention on GP but also some more comprehensive green practices accordingly strengthen the relationship between GP and GSCM.

**Integration with suppliers**

According to the case study, a good relationship with supplier is also a significant factor to strengthen the relationship between GP and GSCM. Having a long and stable relationship with supplier can make supplier more willing to cooperate with company to achieve the green purchasing requirement and even further sustainability goal. In another words, it is the environmental collaboration with supplier (Yen and Yen, 2012). Companies that have better GP can also promote the suppliers have better GSCM. Like Guitang case, companies send professionals to instruct farmers in sugarcane plantation, to plant ecological sugarcane and provide ecological fertilizer to them in order to get high quality sugarcane. In addition, company’s size, type and internal management directly affect the relationship with supplier. For example, in Guitang case, it is a big state-owned local sugar refinery. The main supplier, local sugarcane farmers, has to have a long-term relationship with it to a certain extent. For farmers, they can have more reasonable plant arrangements and improve their own development. Integration with suppliers can directly connect GP to GSCM and enhance the relationship between them.

**Top management commitment**

Top management commitment is a key factor that can directly decide the development direction, strategy and even the cost on green practices (Muduli et al., 2012). It involves the guidance on action and financial support. Although GP is a very important part in GSCM, how much investment on green purchasing actually is made depends on the top management. Top management may have a sustainable awareness but while considering about the cost or implementation conditions they may not take action. In Guitang case, top management not only
has an overall planning of GSCM but also has clearly green purchasing strategy such as resource changes and control, integration with suppliers and reuse and recycles. It pays a lot of money and time on GP. However, how to have a further improvement of GSCM and not only stay in GP stage is worth thinking about for top management. According to the interview, Guitang does not have a related department or a manager take responsibility for GSCM part. Hence, let someone work for GSCM not only GP and take action not only put forward the planning is a feasible way to strengthen the relationship between GP and GCSM for top management.

From the previous study of this relationship, authors categorize three most critical aspects which could be affected by these factors and strengthen the relationship between GP and GSCM.

5.3.1 Sustainable Awareness

According to the interviews of Guitang’s staff, most non-management employees have limited knowledge and understanding of the GSCM in Guitang. However, when it comes to environment topics, they give several green purchasing strategies and even define this. When asking the manager in quality control department, the structure of GSCM in Guitang is described as well as the external relationships with suppliers and customers. This shows the view that GP is a more action-driven program and GSCM is more depended on the whole vision and leadership with longer perspective (Nagel, 2000). Like most companies in emerging market especially in China, green practices are not structured integrated in a well-performed management system. They just have some understanding of some green practices in supply chain because of their own work or relative field. Therefore, the concept of green supply chain management is unfamiliar. However, they all know green purchasing because the inbound materials are involved in every production process. Guitang group often send employees to help their supplier (sugarcane farmers) to deal with the sugarcane cultivation and transportation. Hence, they have a better understanding of green purchasing. Otherwise, top management not
only has specific green purchasing strategy but also has a plan of green practice as a whole perspective. In 2004, after a deep research, Zhu and Cote helped Guitang Group to form the concept of green supply chain management. Then, top management pays more and more attention to GSCM. These also reflect the view that GP creates awareness from bottom to up while GSCM spread the green conscious from top to down (Nagel, 2000). Therefore, training employees to improve the awareness of overall GSCM can help companies achieve the transfer from GP to GSCM. Top management also need a high-level awareness to contact GP and GSCM.

5.3.2 Implementation Scope

Green purchasing is the inbound part among the green supply chain generally, which focuses more on the relationship between supplier and producer. Each inbound process can constitute a supplier chain. Hence, promote the green purchasing level can help to achieve a high level GSCM level.

![Fig. 11 Close-loop of GP](image)

In the theory, Miemczyk and Fohnsen (2012) detailed introduced three levels for green purchasing, dyadic relationship level, supply chain level and industrial network level. Yuan et al. (2006) also put forward that circular economy has three levels, the eco-enterprises at the micro-
level, the eco-industrial parks at the meso-level and the eco-regions at the macro-level. In Guitang case, some production process can be seen as the level of green purchasing. It related to the level of circular economy.

For example, the paper production is in dyadic relationship level that pays more attention to the internal activities and processes and helps Guitang achieve eco-enterprise, regarding pulp workshop as A, paper mill as B and sewage treatment pool as C. The inbound from A to B is pulp, the inbound from B to C is white water and the inbound from C to A is industrial water. Paper mill get pulp from pulp workshop and output white water to sewage treatment pool. Then after dealing with the white water in sewage treatment pool, the industrial water will be re-entry in pulp mill to produce pulp.

The fertilizer production is in supply chain level that is directly related to the supplier. A is sugarcane farmers, B is alcohol plant and paper mill and C is fertilizer workshop. The inbound from A to B is molasses, the inbound from B to C is alcohol residual and filters mud and the inbound from C to A is fertilizer. Part B is also involves sugar factory and pulp workshop. The sugarcane from farmers will be transformed as molasses and bagasse in sugar factory. Then the molasses will be made for alcohol and remain alcohol residual. Bagasse will be made for pulp then become paper and output filter mud. Sugarcane farmers as an external factor not only provide sugarcane for Guitang but also buy the fertilizer from Guitang.

The third level that is industrial network is a regional network without focusing on one specific company. Each upstream also can be seen as the downstream. Through the completely inbound process, it forms a supply chain. Thus, in a perspective of industrial network level that includes all the direct and indirect actors in the whole operation, every industry will work as upstream and downstream simultaneously in some specific fields. It can help the construction of eco-industrial parks as the meso-level of circular economy due to the core idea of circular economy.
is let manufactured products or by-products be used as resources for other industries. As Guitang case shows, the main customers of Guitang like Coca-cola and Wal-Mart have a strict requirement for its products, then Guitang has to require sugarcane farmers provide high quality sugarcane. Meanwhile, farmers offer Guitang high quality and ensure sustainable suppliers can let Guitang have a better production and then provide organic fertilizer back to them. It can be summarize that if the downstream of the company has higher requirement, the company will do well in its own development and require a lot for its upstream. On the contrary, if the offers from upstream reach a high level, the company can produce better to downstream. Hence, have a long-term planning, based on higher level of GP will cause closer links to GSCM, and then achieve a higher circular economy level.

Furthermore, the previous model made by Zhu and Cote (2004) was made for cement production. Now, Guitang canceled this production line because the return on investment is low. Guitang developed the biogas from sewage treatment. It also reuses the residual and provides energy for Guitang.

5.3.3 SUSTAINABILITY LEVEL

Through interviews and deep study of the case company, Guitang, it is obvious that both green purchasing and green supply chain management approaches exist, and the GSCM is well developed in Guitang from the study of Zhu et al. in 2004. Guitang has applied the sustainable management since middle of 20th century leading with the program of ECO-park. Even today most of the sustainable strategies in Guitang are still initiated as the green purchasing strategy as mentioned in the findings. Through several decades, they still set their sustainable goals as “Turning wastes into treasure, saving energy, promoting cleaner production and building a circular economy”. More interesting thing is that the higher position in company’s administrative structure, knows more comprehensively and systematic about sustainable management system such as GSCM which is common in other Chinese companies.
Furthermore, from the documents given by the staffs, those actual activities are always from the GP perspective and as well as the way staffs related to those sustainable activities.

This indicates that GP is more familiar than GSCM in lower level (also could be proven in level of sustainable conscious) and it is consistent with and strengthens the theory part which concluded by Nagel (2000) that GSCM has higher sustainability level than GP. The characteristics of higher sustainability levels explained by Nagel as more strategic project, pro-active like eco-design for product or process, leading by vision and good leadership, from long-term perspective, create sustainable consciousness from top-down, trigger more innovations, cost efficiency and relevant to product’s life-cycle management. Make a comparison of these features and Guitang’s case, 1) the awareness creation does not penetrate the non-management level which hinders the performance of green activities as well as the relationship between GP and GSCM; 2) the green program is more and more strategic with long-term perspective, which also helps to maintain the customer and supplier relationship, and further enhances the relationship between GP and GSCM; 3) the eco-design and innovations could be found everywhere in Guitang, such as plenty of recycling and reusing mentioned in findings. Without doubt, a systematic and supply-chain level thinking help trigger more green innovations in Guitang; 4) a life-cycle management could give better control of materials as well as the relationship between upstream and downstream for company, while lack of external reverse logistics and binding contract with coal supplier in Guitang could affect the efficiency and the interaction between GP and GSCM.

The GSCM is a natural product of GP development to a certain extent through the development of sustainability in this case, which is supported by the three level sustainable purchasing & supply analysis theory by Miemczyk and Fohsen (2012). Nevertheless, thanks to GP is an irreplaceable part in sustainable management, comprehensively increasing the sustainability
level in different way and aspects in company is an effective way to strengthen the relationship between GP and GSCM.

5.3.4 FROM THE PERSPECTIVE OF GP

In Guitang’s case, there are multiplied-products within a complicated production system. Totally five products from the model of GSCM in finding part, which means there are five product lines and the way of skillfully link various production lines is using reduce, reuse and recycling as joints. There are different green purchasing activities: reuse of molasses, reuse of alcohol residual, reuse of bagasse, reuse of filer mud, reuse and recycle of wastewater, reuse of biogas, recycle of fertilizer, recycle of alkali, relationship management with suppliers (technical-integration with sugarcane, logistical-integration with sugarcane, supplier selection with coal), relationship management with customers. All those strategies or activities form a well structured supply chain management or supply network management in Guitang.

It could further explain and strengthen the concept of Miemczyk and Fohsen (2012), and be consistent with Nagel’s (2000) view that GP is a more conscious bottom-up building. In this case, from the perspective of bottom-up, the whole model of GSCM could be seen as made up by the dyadic relationship level of GP. Each single piece of dyadic relationship is conducted in the specific order that could also refer to the sustainable consumption and production (figure 1) that introduced the sustainable product life cycle. The supply chain management is exactly the product’s life management from cradle to cradle. From this case, a comprehensive green purchasing system could promote the green supply chain management’s development and the GSCM can provide direction for green purchasing activities as Nagel found in article that GP is a more action-driven program, while GSCM is strategic. From the perspective of GP, strengthening the joint will improve the relationship between GP and GSCM.
5.3.5 From the perspective of GSCM

Focusing on the end-of life management in Guitang’s case, there seems to be nothing to study, because the residual materials always go to remanufacturing or reversing. Guitang does a great job in this field, the recycling rate of waste materials is reaching 80 to 90 percent, and they almost achieve the goal of non-emission. The materials not only do the internal recycling but also conduct the external recycling, the typical example is the recycling of fertilize from reuse of alcohol residual and filler mud. The organic fertilizer provides the nutrient and condition for development the green sugarcane and thus further achieving the control of the main resource of Guitang. However, until now, all the remanufacturing is conducted internally in the factory and from above analysis of implementation level, the customer of reverse logistics mostly are different manufacturing parts or workshops. The link to actual reverse from the external customers is weak in Guitang’s case.

Combining the Guitang’s model with the model of GSCM introduced by Hervani et al. (2005) shows in literature. The solid line of RL means the exiting reverse line in Guitang, while the dotted line means weakness point of reverse in Guitang Group. While from a more creative perspective, the sugarcane farmers who are also treated as customers which Guitang provide the fertilize, seed, and technology to support their green development, and in this case the reverse logistics could stand for the sugarcane, and green purchasing exchange the position with reverses logistics.
Consider the sustainable development of Guitang from the perspective of top down, with many other articles mentioned (Zhu et al., 2008; Jabbour et al., 2013; Dheeraj and Vlshal, 2012). As we can see, the theory came up by Hervani et al. (2005) summarized GSCM as form of four components of green purchasing (GP), green manufacturing (GM), green distribution (GD) and reverse logistics (RL), and many other authors have agreed with this point. In Guitang’s case, purchasing, materials management and inbound logistics, which counted in the GP, is well developed and performed as well as the GM that involves the design of process and source reduction. Additionally, GD is driven by the third party logistics while the packing still influence a lot. The RL as the distinctive innovation is the linkage of the green purchasing and green supply chain management that provides a return back flow of the material and makes the flow cycle. The reverse logistics always come along with the concept of clean production that promotes the zero emission and waste from factory. GP plays an important role in each parts of GSCM, and without doubt, the whole development of GSCM could pull the improvement of GP, as Zhang (2000) also claimed. From the perspective of GSCM, the way to strengthen the relationship between GP and GSCM is improving the relationships between GP and other part of GSCM especially reverse logistics and improving the integrity of GSCM both on supply chain level and on industrial level. It could promote the consanguineous contact between GP and GSCM not only within one company but also within target on industrial network.

5.3.6 Suggestions for Guitang Group

There are some additional opinions for Guitang. Its main supplier is local sugarcane farmer that not need to chose, there are still some other suppliers, which provide coal and wood pulp. Although Guitang has many strict standards, it has not a comprehensive model to select the supplier. Therefore, establishing a supplier selection model can let company have a clear understanding of supplier and facilitate to do the comparison. As mentioned in the theory, reverse logistics is a “closing the loop” of supply chain which aims at ensuring materials and
products can return from user to producer in order to be reused, recycled and reconditioned. Cultural paper as its main product is sold to companies and supermarkets. Guitang can recycle the cultural paper after use. It is also a good way to enhance the relationship with customers and promote the implementation of reverse logistic.

According to the interview, the non-management employees do not have a comprehensive recognition about the completely green supply chain management. Hence, Guitang can spread related knowledge and do some related training for them. Moreover, a comprehensive and advanced development planning and management system can make staffs pride of themselves. It will let all staffs to have a unit goal and willingness to work hard for it.
6. **CONCLUSION**

Based on the literature review and finding, the two main purposes of this paper summarized from the analysis part:

5. What are the drivers and barriers for Green Supply Chain Management development in Guitang Group?

6. How to strengthen the relationship between green purchasing and green supply chain management? In addition, give some suggestions for strengthening the relationship between GP and GSCM based on the analysis.

As for the drivers and barriers for implementing GSCM, as mentioned in theory part, drivers and barriers are generally discussed in many articles. According to the survey and interviews in finding part, the components of them are mainly consistent while the significance of each category shows a big difference as analyzed in the analysis part. If the importance arranged from high to low, the list of drivers for implementing GSCM in emerging market especially in the Guitang’s case should be in order of rise of resources utilization, government legislation and regulation, customer pressure, requiring of competitiveness, environmental pollution and lack of resources, challenge faced by international market, and economic position and corporate image. In the same way, barriers are attitude, poor legislation, and lack of sustainable guidance, initial investment, economic uncertainty and top management commitment. However, this result highly depends on the Guitang’s case, which means the specific background of China play a key role through the analyzing. The distinctive features of emerging market, which strong government power and weak recognition of sustainable in society, contribute to this consequence. However, it is worth to be considering that these characteristics of emerging markets especially of China could lead to several potential threats. Too much intervenes and supports from government and weak awareness of society may lose the independent ability of
companies. They need to add more elements in market and society integrations that could provide the driver and overcome the barriers in a more sustainable way.

As for the second research question, the analysis is based on the definition of GSCM and the first RQ result by considering four critical factors—Government pressure, customer pressure, supplier integration and top management commitment. Higher sustainable awareness, extending implementation scope and higher sustainability level are analyzed as three ways to strengthen the relationship between GP and GSCM at the specific background of Chinese market. Through the analyzing, the interaction between GP and GSCM could be strengthened by improve those factors which have significant impact on their relationship. Combining with the case, there are two directions to enhance the performance and make them more cohesive from GP’s perspective or from GSCM’s perspective. Based on the case study, the relationship between green purchasing and green supply chain management is promoting and complementing each other. The finding strengthens the view of the previous study that conducted by Nagel that GSCM has higher sustainability level than GP. There is a distinctive path that the development of green purchasing breeds the concept of green supply chain management, and green supply chain management in turn promotes the complete of the green purchasing. One more things, the case typically reflects that calling for the completion and improves of green purchasing, the concept of green supply chain management in Guitang is virtually gradually forming. While according to the common feature of emerging market, this article indicates that not only consumer sustainable conscious, even staffs have lack of the sustainable conscious especially for GSCM. This further reflects that the concept of green supply chain management do not run through the whole company thus worker could hardly feel the purpose and senses of achievement from activities in China. The weakness of external reverse logistics in Guitang also strengthens this view that GSCM is not mature enough in most Chinese companies. In this case,
green purchasing is more acceptable to public and mature developed in Chinese market, it is better for them to strengthen the relationship from the perspective of GP.

6.1 CONTRIBUTION

From the academic point of view, this thesis did a comprehensive literature review and fill the gap of barriers and drivers of implementation GSCM in allusion to the importance and insufficiency of this field that state in background based on the case study of Guitang Group. Also summary the previous study about the relationship between GP and GSCM to figure how to enhance the interaction between the two. These provide plenty of materials and data for future further study and help others get resources easily.

In additional, from the perspective of empirically implementation, authors get many drivers for green supply chain management especially in emerging market, like increasing resources utilization, government legislation and regulation and customer pressure. Attitude problems, weak society pressure and lack of the sustainable guidance are the main barriers for Guitang Group and even for others in emerging market. Some of them extend to threats. It can let them take into account these factors and avoid unnecessary risks when they want to implement the green supply chain management. It also let a wide variety of companies especially manufacturing companies in China pay more attention on green supply chain management and want to have a systematic green practice. Moreover, authors provide some suggestions for Guitang Group depend on the whole literature review and case study. For example, it can establish a supplier selection model, recycle the cultural paper from customers and do some sustainable training for employees.

6.2 LIMITATION

According to the time limitation and geographic limitation, authors cannot do deeper research by visiting the actual production workshops. It takes a relatively long time to find suitable interviewees. Consequently, the questionnaire preparation time for the interviewees is
insufficient as well as the number of participants. The 76% of questionnaires we have are incomplete which take a relatively high proportion, and those result turn to be invalid. By the way, the interview time and interview persons are not enough to get a very objective result. This process also hindered and delayed the planning timetable of our writing.

In addition, this case study is a single case study, so it has a certain degree of particularity adding by the specific development background of Guitang and the identity of the state-owned enterprises. The particularity could be shown in many aspects such as its geographical characteristics and strong government supports. Thus may contribute to specialization of the chosen case that means hinder the process from individual case to general concepts. Some drivers and barriers may not suitable for others that have different background. Moreover, all company profile comes from official website. It may not objective enough and the information may not exhaustive. There is certain randomness in selected literature. All of them are suitable for this thesis but may not be the most appropriate and not comprehensive. The sustainability involved in this paper mainly focuses on environment part not so such about economy and society. Because of the knowledge limitation of some specific field, some processes in this model of Guitang are not well explained, for example the Alkali reduction techniques.

Due to all the interviews, the materials they gave and the official website are in Chinese. Thus, the translation of that information may have some small errors. Our knowledge based on bachelor’s degree. Therefore, this thesis may have some limitation of terminology.

6.3 FURTHER STUDIES

This thesis only provides a mode of thinking and a possibility about from green purchasing to green supply chain management. However, how to implement the conversion in practice is worth researching. During the further study, more case studies are supposed to be added. And deeper research helps to get the concrete steps about the transition from green purchasing to
green supply chain management based on this thesis. The critical issues, evaluation and assessment methods and the mechanism of continuous improvement are also worth considering.
7. REFERENCES


**Interviewees**

Zhenjian Lou, manager of quality control and deputy director, Guitang Group, interviewed 2013-05-16, during 1 hour

Xiaoyan Huang, minister of statistics and planning, Guitang Group, interviewed 2013-05-16, during 2 hour

Jianjia Zhong, general staff, Guitang Group, interviewed 2013-05-16, during half an hour
### APPENDIX Ⅰ

**Table 1: General Drivers from Literature Review**

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Authors</th>
<th>Kushwaha, 2010</th>
<th>Lamming &amp; Hampson, 1996</th>
<th>Zhu et al., 2005</th>
<th>Zhu &amp; Geng, 2001</th>
<th>Zhu &amp; Cote, 2004</th>
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<td>✓</td>
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<tr>
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**Table 2: General Barriers from Literature Review**

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<th>Yen &amp; Yen, 2012</th>
<th>Mathiyaz hagan et al., 2013</th>
<th>Helen et al., 2008</th>
<th>Muduli, 2012</th>
<th>Giuniper o et al., 2012</th>
<th>Jacobsen, 2012</th>
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<tr>
<td>Initial investment</td>
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<td>✓</td>
<td>✓</td>
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<td>Lack of sustainable guidance</td>
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<td>Top management commitment</td>
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<td></td>
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<td>✓</td>
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<td>Poor legislation</td>
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<td></td>
<td>✓</td>
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<td>Weak pressure from society</td>
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<td>✓</td>
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<td>Attitude</td>
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<td>✓</td>
</tr>
</tbody>
</table>
APPENDIX II INTERVIEW QUESTIONS

Interviewee: Zhenjian Lou

1) Concept of GSCM in Guitang
i. When do you have the concept of green supply chain management and put it into practice?
ii. What are the reasons for building this system and different factors that promote and motivate the development of GSCM in Guitang Group?
iii. Through implementing this system, are there some barriers and risks exist and will those a threats in further development?
iv. How do you implement the GSCM?
   i. How many products lines your company has?
   ii. How do you structure and design them?
   iii. What green practices involved?

2) Green purchasing in Guitang
a) How about purchasing related green practices and do you have special strategies for green purchasing?
b) In your opinion, what do you think of the role and position the green purchasing play in your whole GSCM system?

3) Relationships with suppliers and customers
a) About suppliers
   i. How do you select your suppliers?
   ii. Do you have stable suppliers with long-term corporation?
   iii. How do you manage the relationship with them?
b) About customers
   i. We know you provide products for many large international companies like Wal-mart, Coca-Cola, and Pepsi-Cola and so on. Do you think GSCM offer a distinctive competitiveness for Guitang to get their favor?
   ii. On the contrary, in what way they promote GSCM development in Guitang?

4) Present situation and further study
i. What goals you have got until now in the GSCM and what goals you have not?
ii. Do you have some further planning in this field?

Interviewee: Xiaoyan Huang

1. What are the reasons for building this system and different factors that promote and motivate the development of GSCM in Guitang Group?
2. Are there some barriers and risks when implementing GSCM?
3. In your opinion, what is the relationship between GP and GSCM?
4. The layout of the production process
5. What are the resources recycle utilization rate?
6. Investment in GSCM

**Interviewee: Jianjia Zhong**

1. Are you familiar with the concept of GP and GSCM?
2. As your own view, why company implement GSCM and do you have some feeling about the change of working environment?
3. Through the actually implementation, what difficult you have met so far?
4. Did you get some training in this field?
5. What related green practices involved in your work?
6. What is the attitude toward GSCM among you and your workmates?
APPENDIX III SURVEY CHARTS

Siqi Liu and Peijia Wang

Hi, we are the students from University of Gävle, and we are doing a study on the green supply chain management in your company as the final thesis. We need to collect the information of drivers and barriers for implementing the GSCM in Guitang. The point from 0 to 5 is stand for the significance of each factor. If you think it is extremely important you mark in the five categories, while if no influence at all marks 0 in this field. In addition, if there are some others drivers/barriers do not list in this chart, you can just write them in the part of “other drivers/barriers”. Thanks so much for your cooperate and help! If there are any further question or information about this questionnaire or Guitang companies you want to communicate with us, reply the email, and we will response you as soon as possible. Best wishes!

DRIVERS FOR IMPLEMENTING GSCM IN GUITANG

Other drivers:

<table>
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<tr>
<th>Drivers</th>
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<td>Environmental Pressure</td>
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<td>Government Policy</td>
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<tr>
<td>Customer Pressure</td>
<td>2</td>
</tr>
<tr>
<td>International Challenge</td>
<td>3</td>
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<td>Increase Resources Utilization</td>
<td>4</td>
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<tr>
<td>Competitiveness</td>
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<td>Image</td>
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<tr>
<td>Barriers</td>
<td>Points</td>
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<tr>
<td>Initial investment</td>
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<td>Lack of sustainable guidance</td>
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<td>Top management commitment</td>
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<td>Poor legislation</td>
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<td>Weak pressure from society</td>
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<td>Economic uncertainty</td>
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<tr>
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Other barriers:
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<th>Title</th>
<th>Topic</th>
<th>Method</th>
<th>Conclusion</th>
</tr>
</thead>
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<tr>
<td>Kushwaha, 2010</td>
<td>Sustainable development: a case study of the curvature</td>
<td>Literature review</td>
<td>Case study, GTMA</td>
<td>Try to describe the curvature group and its implementation model, analyze challenges, and provide some solutions for green supply chain management. Provide action plans and facilitate knowledge to green the business efficiently.</td>
</tr>
<tr>
<td>Zhu and Cote, 2004</td>
<td>Integrating green supply chain management into an environmentally eco-industrially</td>
<td>Literature review</td>
<td>Case study, single-case study</td>
<td>Describe the GSCM development of Guitang Group, provide background, model, challenge, and solution.</td>
</tr>
<tr>
<td>Muduli et al., 2012</td>
<td>Barriers to green supply chain management in Indian mining industries: a graph theoretic approach</td>
<td>Literature review</td>
<td>Case study, single-case study</td>
<td>An attempt has been made in this paper to quantify the values of barriers through a systematic approach. Identify factors and sub-factors hindering GSCM implementation.</td>
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<td>Case Studies</td>
<td>Literature Review, Case Studies</td>
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<td>Zhu and Geng (2001)</td>
<td>Study of large and medium-sized enterprises (LMSOE)</td>
<td>Environment as a supply chain</td>
<td>Case studies of green purchasing and supply chain management based on environmental management</td>
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<td>Livingstone and Sparks (1994)</td>
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<td>Government policy</td>
<td>Government policy and Environmental Purchasing and Supply Chain Management Based on Environmental Management</td>
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<td>Companies have to do some green environmentally friendly practices to be seen as environmentally friendly goods.</td>
<td>Government policy</td>
<td>Government is a main driver for environmentally friendly practices and environmental activities. Companies' environmental purchasing and supply chain management can directly influence and control environmental activities and help in developing environmentally friendly goods.</td>
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<tr>
<td>Year</td>
<td>Authors</td>
<td>Title</td>
<td>Methodology</td>
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<td>2000</td>
<td>Nagel</td>
<td>Greening the supply chain: A new initiative in South East Asia</td>
<td>Literature review, survey</td>
<td>Integration with supplier, commitment of top management, customer satisfaction, environmentally friendly products, higher sustainability level, increased focus on sustainability, increased focus on GSCM.</td>
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<td>2002</td>
<td>Yen and Yen</td>
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<td>Top-management's role in adopting green purchasing standards, environmental collaboration with suppliers, integration with suppliers, customer pressure, and environmental collaboration with suppliers.</td>
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<td>Zihan, 2001</td>
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<td>a structured literature review of definition and measures at the dyad, chain and network levels</td>
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<td>i. Problem existing in the new area of environmentally conscious supply chain, renewable energy and materials were stated.</td>
<td>i. Problem existing in the new area of environmentally conscious supply chain, renewable energy and materials were stated.</td>
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<td>ii. Literature on this field were reviewed</td>
<td>ii. Literature on this field were reviewed</td>
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<td>iii. Model were established</td>
<td>iii. Model were established</td>
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<td>In supply chain, environmentally conscious building management is highlighted through the The sustainable awareness of CP is</td>
<td>In supply chain, environmentally conscious building management is highlighted through the The sustainable awareness of CP is</td>
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<td>Chan &amp; Lau, 2008</td>
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</table>
| **Sustainability level**<br>Integrates environmental factors into supply chain management through product design, material purchasing, environmental management, and end-of-life management. | **Confirmation of a measurement model for green supply chain management practices implementation**<br>Aim to empirically investigate the construct of and the scale for evaluating GSCM practices implementation among manufacturers. Surveys, data collected from 341 Chinese companies. All 21 measurement items are critical attributes of the five underlying factors of GSCM practices implementation.

| **Explaining Green Purchasing Behavior**<br>Aim to assess how well highly popular behavior model, the theory of planned behavior, is able to explain consumers’ green purchasing behavior. | **Explaining Green Purchasing Behavior**<br>Compared to American market, Chinese consumer carry out eco-purchasing activities mainly out of norm subjective rather than environmental attitude. Survey of Shanghai and Los Angeles, samples and procedure.

<table>
<thead>
<tr>
<th><strong>Survey of Shanghai and Los Angeles,</strong> samples and procedure</th>
<th><strong>Survey of Shanghai and Los Angeles,</strong> samples and procedure</th>
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<td>Lin</td>
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<td>Dheeraj and Vishaj</td>
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85
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<th>Year, et al., 2005</th>
<th>Yuan, et al., 2006</th>
<th>Deloitte &amp; Takahashi, 2013; Papa &amp; Gleason, 2012; Gentry, 2007; Bouton et al., 2012</th>
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<td><strong>Survey, case study, multi-case study</strong></td>
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<td>consumer awareness</td>
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Hervani et al., 2005: Performance measurement for green supply chain management. Implementation scope.